

# MTb

BULLETIN of the NETHERLANDS SOCIETY for TROPICAL MEDICINE and INTERNATIONAL HEALTH

N° 04 / DECEMBER 2014 - VOLUME 52

PHOTO: HANNEKE DE VRIES

**SURGERY AND ORTHOPAEDICS**  
RESEARCH, TREATMENT AND CURRENT ISSUES



# CONTENT

2

## EDITORIAL

3

## OPINION

The current role of surgery in global health

8

Feasibility and barriers of orthopedic surgery, especially the clubfoot

23

A toxic mix of white and professional arrogance

6

## EVIDENCE BASED

The epidemiology of orthopedic conditions

11

## PRACTICAL PAPERS

Non-tuberculous chronic osteomyelitis

14

## CLINICAL PAPERS

Treatment of the clubfoot

16

Blount's Disease

19

## COLUMN

Surgery in rural areas: from simplicity to multitasking

20

## TRAINING

Strengthening of the Sierra Leonean Health System

24

## CONGRESS

European Congress in Basel, Switzerland

25

## CONSULT ONLINE

Mycetoma

## A PLEA FOR SIMPLE, SAFE AND STABLE SOLUTIONS

**I**n Amsterdam in November a three-day international symposium was held on Surgery in Low-Resource Settings (organized by the Netherlands Society for International Surgery and the German Society for Tropical Surgery). Participants from more than 150 countries gathered to discuss current needs and solutions in accessing surgical services in low- and middle-income countries (LMICs). An urgent call, given the shocking figure of over 2 billion people worldwide having limited access to basic surgical care. Caesarean sections, severe limb fractures or tumours are left untreated, simply because of a lack of surgical skills and trained doctors.

This edition of *MTb* places the lens on surgery and orthopedic ailments in LMICs, with most papers dealing with orthopedic ailments. Though these conditions are usually not life-threatening – with the exception of the malignant tumours – physical disability often results in economical and social distress because of loss of job, regular income and family life, as well as stigmatization and discrimination by the community. In the early seventies most of the pathology consisted of disabilities due to poliomyelitis, clubfoot or Blount's disease. Today, with the push back of polio due to the mass vaccination campaigns, there has been a shift in pathology to traumatology in part because of an increase in traffic accidents frequently resulting in an osteomyelitis.

Operations are costly. Unfortunately, many low- and middle-income countries lack a sound financial system to prevent people from facing catastrophic payments when in need of an operation. In such circumstances 'simple, safe and stable solutions' could be the credo. According to Ger Olyhoek, the coordinator of some of the contributions to this *MTb*, "this includes non-operative treatment or use of an external fixation, to avoid expensive complications even when this will interfere with common

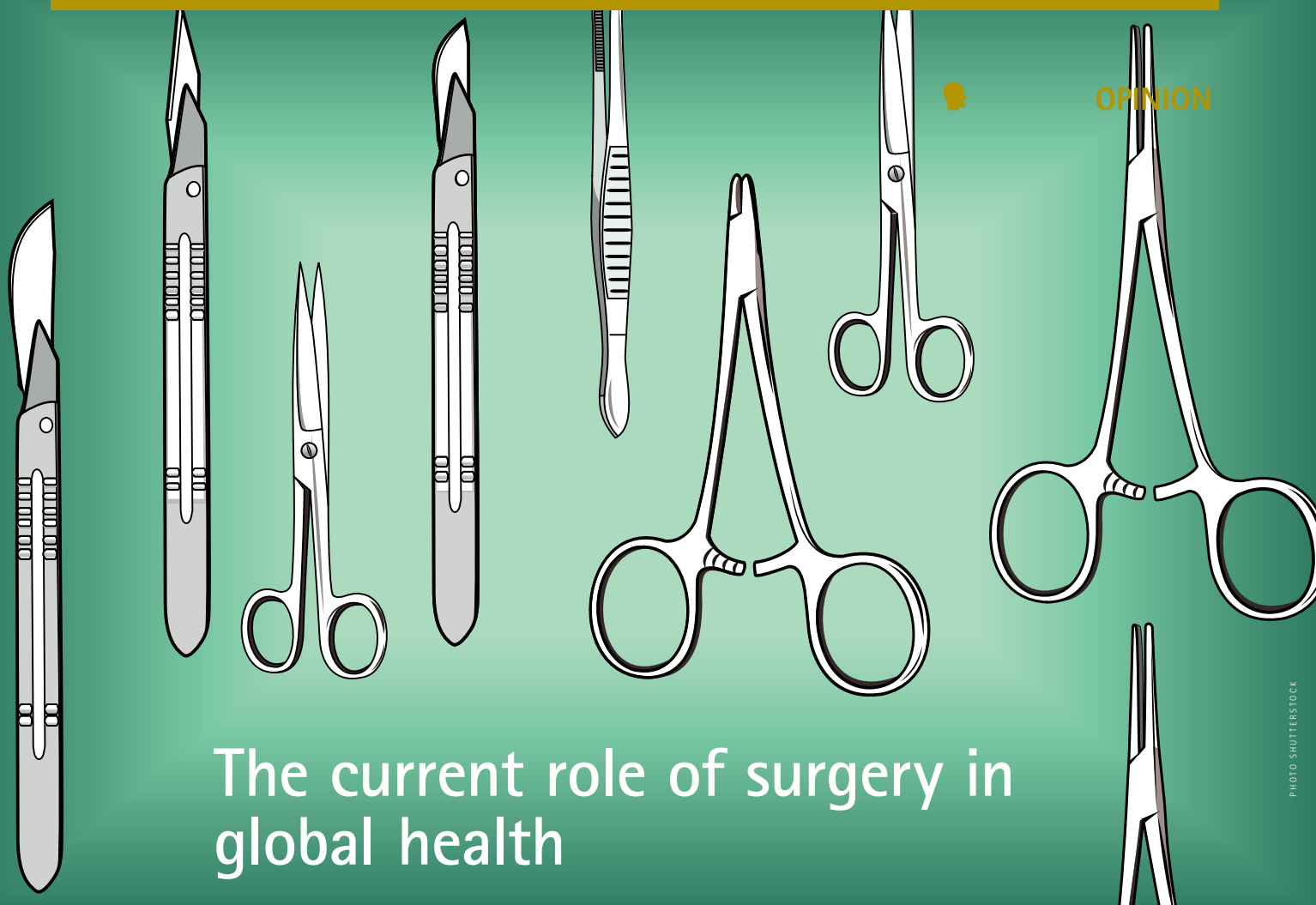
Western way treatment standards. In my personal opinion it will be our duty to teach the Young Residents in LIMCs these techniques."

The congress on surgical needs in November 2014 not only outlined the contours of the inadequate access to surgical services. It also presented solutions for ways to invest in human resources, such as through the implementation of a training programme for health workers in LMICs. More capacity is needed to respond to a growing need for surgical care. However, training more surgeons is not enough to face current needs. We need to invest in providing additional training for doctors and nurses to perform certain procedures. In addition, in an open letter to global health agency leaders (published in *The Lancet*, Volume 384, Issue 9956, 15 November 2014) a group of concerned surgeons and institutions addressed the importance of surgical indicators to be included on the WHO Global Reference List of 100 Core Health Indicators. The proposed list currently fails to provide an adequate metric for global surgical care, as surgical wound infection rate represents the only indicator pertaining to surgery. The authors believe that this is a flawed indicator that fails to track crucial elements of surgical care such as access, volume, safety, workforce availability, or financial protection.

## THE YEAR 2015 HAS BEEN ANNOUNCED AS THE INTERNATIONAL YEAR OF SURGERY

Let's hope the contributions in this edition of *MTb* help to highlight the pressing need of access to essential surgery in LMICs.

GER OLYHOEK / GOLYHOEK@GMAIL.COM  
HANS WENDTE / HANSWENDTE45@GMAIL.COM  
ESTHER JURGENS / EJURGENS.NVTG@XS4ALL.NL



## The current role of surgery in global health

PHOTO: SHUTTERSTOCK

**T**here is an increasing global burden of surgical disease. Despite this, many Low- and Middle-Income Countries lack surgical capacity and therefore the world's poorest population barely has access to safe surgical care. As a consequence, the number of preventable deaths and disabilities is increasing to unacceptable levels. In recent years, basic surgical care is slowly receiving more attention from the global health community. New evidence has propelled the recognition of surgical care into a crucial component of primary health care. This has led to a growing number of international organizations, such as the WHO, to start to address the need of global access to surgical care. However, there is still a long way to go for raising awareness and promoting possible interventions.

In this essay we aim to illustrate the worldwide public division in access to surgical care. We also present evidence that demonstrates surgery should be seen as a critical component of global public health. In addition, we give examples of current efforts made by international organizations to improve access to surgical care. Our purpose is to show that there are interesting opportunities for the Dutch government and doctors to get involved in current international developments regarding surgical care.

\* years of healthy life lost = disability adjusted life year = DALY

### THE PUBLIC DIVISION IN ACCESS TO SURGICAL CARE

Diseases treatable by surgery form a significant burden of disease worldwide. Injuries, complications of childbirth or cancer are responsible for 11% of the global burden of disease.

<sup>(1)</sup> Pre-term birth complications form the eighth leading cause for the global burden of disease, and road traffic accidents are the tenth leading cause. For example, pre-term birth complications accounted for 76,982 million years of healthy life lost\* in 2010. In comparison, HIV/AIDS caused 81,547 million years of healthy life lost. <sup>(2)</sup>

Despite surgical diseases causing a significant burden of disease, there is a public division in access to safe surgical care. The poorest 2 billion people in the world receive only 3.5% of the surgical procedures undertaken worldwide, whereas the richer parts of the world receive 96.5% of all procedures.

<sup>(3)</sup> Other studies show that 56 million people in sub-Saharan Africa are in need of surgical care, but do not have timely access. <sup>(4)(5)</sup> This lack of access leads to a high amount of untreated diseases. A report of the United Nations Population Division estimated that 289,000 women died during childbirth in 2013. <sup>(6)</sup> It is acknowledged that this is partly attributable to the absence of timely surgical care. <sup>(7)</sup> A WHO report showed that 90% of deaths caused by injuries occur in Lower-Income Countries. <sup>(8)</sup> On top of deaths attributable to the unavailability of surgical care, there are many people living with chronic disability due to their illness. For the latter group, their living conditions could improve significantly if they had access to surgical care. According to the Global Burden of Disease Study



the disability caused by neoplasm increased by 27.3% over the past two decades, whereas the disability caused by road traffic accidents increased by 33.2%.<sup>(2)</sup>

**SURGERY GAINING RECOGNITION AS GLOBAL HEALTH INTERVENTION**

Although surgical illnesses cause a significant burden of disease, surgical care has not been a priority of global health efforts. Currently there are no major funding programmes that invest in surgical care. This contrasts with the combat against infectious diseases, which received most of the world’s attention. Nowadays there are numerous successful (funding) programmes for controlling infectious diseases. For example, the Global Fund to Fight AIDS, TB and Malaria invested \$3,900 million in public health interventions in 2013, the Netherlands being one of the top 10 donor countries.

Only recently surgery has gained attention from the global health community. New research evidence has spurred the recognition of surgery as a possible global health intervention. Researchers have conducted several cost-effectiveness analyses and findings refute arguments that surgery would be too expensive.<sup>(9,10)</sup> To illustrate, the systematic review of Chao, Sharma, Mandigo et al. showed the cost-effectiveness of several basic surgical interventions. These interventions ranged from male circumcision to caesarean deliveries, and costs were plotted out for every year of healthy life won. (Figure 1) Compared to conventional global health interventions, such as HIV medical treatment, these findings show that most procedures are at least equally or even more cost effective.<sup>(9)</sup>

In addition, efforts to build up surgical services can improve other parts of health care systems too. Developing surgical services will contribute to additional training of personnel, building health care facilities, establishing referral or drug delivery systems. Even though such investments will impede cost-effectiveness in the short term, they are essential parts of developing health care systems in general. This is commonly referred to as diagonal development, whereas building up one part of the system (vertical inputs) increases the access of the health system in general (the horizontal output). It evolves to diagonal strategies over time.<sup>(9)</sup>

To improve quality and availability of basic surgical interventions the focus is not exclusively on surgeons. Training of clinical officers and midwives can help to improve scalability of surgical programmes. There are several programmes that show that trained midwives can conduct surgical interventions with good outcomes.<sup>(11)</sup> They require less time to be trained and help to reduce costs.

**OPPORTUNITIES TO ENGAGE IN CURRENT DEVELOPMENTS**

The arguments mentioned above have mobilized international organizations into action. An important effort emerged in 2004 when the WHO launched the Emergency and Essential Surgical Project (EESC). It aims to address the lack of surgical capacity in Lower-Income Countries.<sup>(12)</sup> The programme has made important steps forward; however, it has yet to be adopted by many national health policies.<sup>(13)</sup> Recently the ‘Lancet Commission on Global Surgery’ was established. Its purpose

is to embed basic surgical care in the global health agenda.<sup>(14)</sup> Additionally, there is a group of several influential surgeons and academics that form the ‘International Collaboration for Essential Surgery’. They recently launched the 15x15 campaign in order to pronounce 2015 as the international year of surgery. They propose that 15 essential surgical conditions should be accessible worldwide by the year 2030.<sup>(15)</sup>

We believe that these developments provide interesting opportunities

for Dutch doctors and policymakers to play an important role in improving access to global surgical care. For example, there are Dutch doctors with experience in providing surgical care in low resource settings. These ‘Doctors in International Health and Tropical Medicine’ followed a training programme that consists of two years of training in basic surgical interventions, integrated with four months of education in tropical diseases

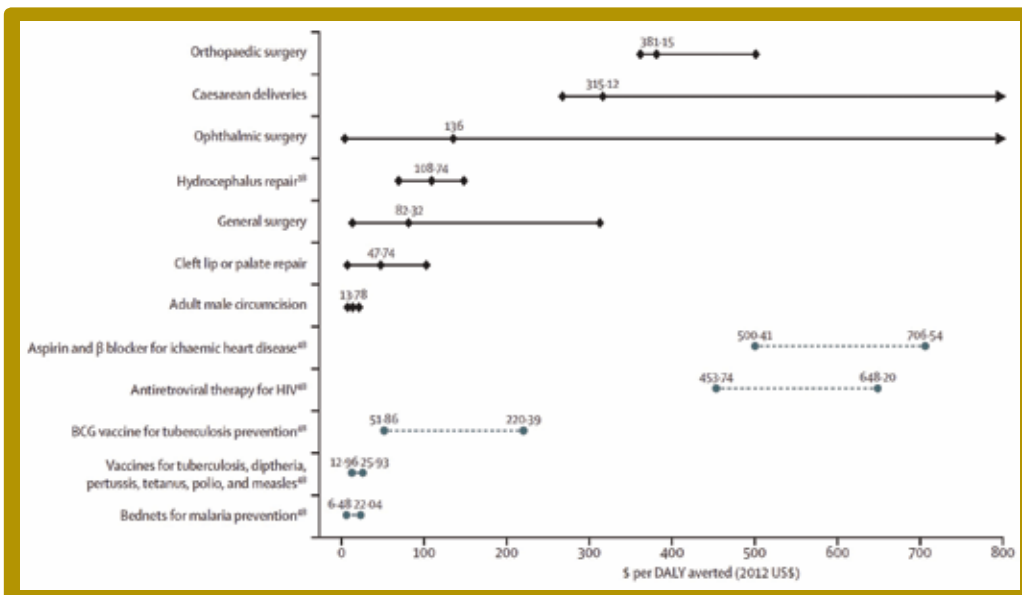
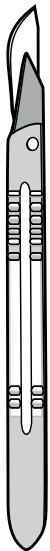


Figure 1 shows the value of surgical procedures relative to traditional public health interventions. The median cost-effectiveness ratios (CERs) are compared in terms of 2012 US \$. Reproduced with permission by Tiffany E. Chao, MD, MPH. Source: Chao TE et al. Cost-effectiveness of surgery and its policy implications for global health: a systematic review and analysis. *Lancet Glob Health* 2014. Jun ;2(6):e334–e345.



and international health at the Royal Tropical Institute. <sup>(16,17)</sup> The training programme provides young doctors with skills to work in the field of global health. They can help to improve access to surgical care by directly providing surgical care. After having gained more experience, these doctors can contribute to knowledge translation. For example, they are capable of training local personnel and building up infrastructure, thereby contributing to longer-term solutions. Finally, their knowledge and experience can be used to advise health authorities on future global health initiatives.

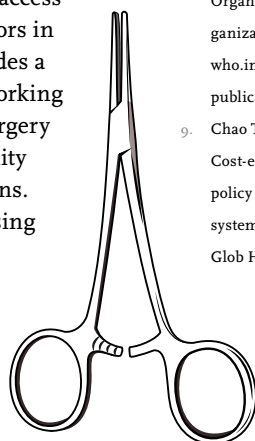
Today, there are many Dutch programmes and individual doctors contributing to make surgical care accessible in low resource settings. Examples of such initiatives are the 'Werkgroep Orthopedie Overzee', 'Partnership for Safe Motherhood', 'Stichting Interplast Holland' and the 'Netherlands Society for International Surgery'. These programmes help to improve access in areas where there is a shortage of skilled surgeons, thereby contributing to the reduction of preventable mortality and disability. However, the cohesion and collaboration between these initiatives still have room for improvement. For example, there is currently no collaborative strategy among the aforementioned Dutch organizations. Likewise, there are no joint lobbying efforts to create awareness among Dutch doctors and policymakers.



In November 2014, the Netherlands Society for International Surgery organized a symposium 'Surgery in Low Resource Settings'. It sought to strengthen surgical availability and skills in low resource settings. The event investigated the role of doctors to contribute to possible interventions. Many major Dutch and International organizations committed to surgery were present. Thereby the symposium raised the opportunity to improve mutual efforts and create stronger links between Dutch actors and international organizations, such as the WHO.

CONCLUSION

Surgical conditions form a major burden of disease worldwide. Yet the poorest two billion people have limited access to safe surgical care, leading to a high amount of untreated disease. Today, new evidence from research spurs the recognition of surgery as a crucial component of Global Health and development. Organizations are increasingly creating awareness of the problem and seek possible interventions. This momentum creates an opportunity for Dutch policymakers, organizations and doctors to collaborate towards providing access to surgical care. The training programme of 'Doctors in International Health and Tropical Medicine' provides a pool of skilled doctors that can play a key role in working towards this goal. In addition, the Symposium 'Surgery in Low Resource Settings' has raised the opportunity to improve cooperation between major organizations. Jointly they can make a stronger impact on redressing the disparity in global access to surgical care.



THOM C.C. HENDRIKS  
MEDICAL DOCTOR, CURRENTLY HE IS APPLYING FOR THE TRAINING DOCTOR IN INTERNATIONAL HEALTH AND TROPICAL MEDICINE.  
THOM.HENDRIKS@GMAIL.COM

MATTHIJS BOTMAN  
MEDICAL DOCTOR IN INTERNATIONAL HEALTH AND TROPICAL MEDICINE, CURRENTLY HE IS IN TRAINING FOR PLASTIC, RECONSTRUCTIVE AND HAND SURGERY.

ROELAND VOORHOEVE  
CHAIR OF THE NETHERLANDS SOCIETY FOR INTERNATIONAL SURGERY.

REFERENCES

1. Debas HT, Gosselin R, Mccord C. Chapter 67 Surgery. In: Disease control priorities in developing countries, 2nd ed Oxford University Press, New York. 2006. p. 1245-60.
2. Institute for Health Metrics and Evaluation. The Global Burden of Disease: Generating Evidence, Guiding Policy. Seattle, WA: IHME, 2013. Vasa. 2013. Available from: <http://medcontent.metapress.com/index/A65RM03P4874243N.pdf>
3. Weiser TG, Regenbogen SE, Thompson KD et al. An estimation of the global volume of surgery: a modelling strategy based on available data. *Lancet* 2008;372(9633):139-44.
4. Groen RS, Samai M, Stewart K-A et al. Untreated surgical conditions in Sierra Leone: a cluster randomised, cross-sectional, countrywide survey. *Lancet* 2012;380(9847):1082-7.
5. Petroze RT, Groen RS, Niyonkuru F et al. Estimating operative disease prevalence in a low-income country: results of a nationwide population survey in Rwanda. *Surgery* 2013;153(4):457-64.
6. WHO, UNICEF, UNFPA the WB and the UNPD. Trends in maternal mortality: 1990 to 2013. Available from: [www.unfpa.org/public/home/publications/pid/17448](http://www.unfpa.org/public/home/publications/pid/17448)
7. World Health Organization. The World Health Report 2005 - make every mother and child count.
8. Peden M, McGee K, Krug E. Injury: a leading cause of the global burden of disease. Geneva: World Health Organization; 2002. World Health Organization; 2002. Available from: [www.who.int/violence\\_injury\\_prevention/publications/other\\_injury/chartb/en/](http://www.who.int/violence_injury_prevention/publications/other_injury/chartb/en/)
9. Chao TE, Sharma K, Mandigo M et al. Cost-effectiveness of surgery and its policy implications for global health: a systematic review and analysis. *Lancet Glob Heal* 2014;2(6):e334-e345.
10. Gosselin RA, Heitto M. Cost-effectiveness of a district trauma hospital in Battambang, Cambodia. *World J Surg* 2008;32(11):2450-3.
11. CapaCare, Medical education and training to increase the number of skilled staff at district hospitals. [cited 2014 Jun 22]. Available from: <http://capacare.org/>
12. Bickler SW, Spiegel D. Improving surgical care in low- and middle-income countries: a pivotal role for the World Health Organization. *World J Surg*. 2010;34(3):386-90.
13. Chirdan LB, Ameh EA. Untreated surgical conditions: time for global action. *Lancet* 2012;380(9847):1040-1.
14. <http://www.thelancet.com/commissions/global-surgery>, cited 2014 Aug 26.
15. ICES International Collaboration for Essential Surgery. [cited 2014 Jun 15]. Available from: <http://essentialsurgery.com/>
16. Opleiding IGT (2014) [nvtg.org/index.php?id=1090](http://nvtg.org/index.php?id=1090)
17. Home - KIT KIT (2014) <http://www.kit.nl/kit/en/>



# The epidemiology of orthopedic conditions in Low- and Middle-Income Countries; countrywide population assessment from Sierra Leone and Rwanda

## INTRODUCTION AND OBJECTIVES

Orthopedic conditions, those concerned with conditions involving the musculo-skeletal system, vary in their presentation, disability, and required treatments. They include both musculoskeletal trauma, degenerative diseases as well as congenital disorders, and management of orthopedic conditions can range from simple traction for a femur fracture, the Ponseti method for clubfoot to reconstructive surgery for severe scoliosis. Given the numerous conditions and their complexity, similarly the epidemiology of orthopedic conditions can be difficult to characterize. In countries with significant barriers which limit access to health care, the incidence, prevalence and disability associated with orthopedic conditions is especially difficult to estimate. Though easier to obtain, hospital data will not give fully accurate estimates as the cost, limited transport and lack of availability of surgeons skilled in orthopedic procedures will often dissuade patients from seeking timely care at health facilities. Another way to obtain data on disease prevalence is to perform national surveys. Via a cluster sampling approach random individuals can be evaluated in a systematic way to obtain information on the conditions of interest. These surveys are often done in settings with limited centralized health data under the name of Demographic Health Surveys (DHS). However, the standardized DHS mostly elicit information on infectious diseases and reproductive health rather than on conditions in need of surgical evaluation and treatment. Therefore the Surgeons Overseas Assessment of Surgical need (SOSAS) was developed. This article is an overview of the epidemiology of orthopedic conditions determined from the SOSAS surveys done previously in Sierra Leone and Rwanda.

## METHODS

SOSAS is elsewhere described in detail<sup>(1)</sup> and an evaluation by the enumerators from Sierra Leone can be found in a prior edition of this journal.<sup>(2)</sup> In brief, SOSAS is a two-stage cluster-based household assessment of surgical need. The study starts by interviewing the head of the household on household demographics and any deaths in the previous 12 months. Following is a structured verbal 'head-to-toe-examination' of two randomly assigned household members. They are asked if they ever had a condition, which should have been surgically evaluated. Responses can include: wound, burn, mass, or deformity and many other symptoms understandable to the layman. Timing and mechanism in case of an injury are also recorded. This article will look at data that relates to trauma and orthopedic conditions from several SOSAS subanalyses previously published.<sup>(3-5)</sup>

## RESULTS

Data from Sierra Leone, from 2012, revealed that at least 24% of the respondents (873 individuals) had at least 1 lifetime traumatic injury, meaning any time during their life which they recalled. Of those 873, 12% (452 individuals) had this injury in the last year. Each respondent could report more than one injury, therefore a total of 1,316 injuries were noted. Females were less likely to report an injury than males with an OR of 0.69 (95% CI 0.57-0.83). From the Rwanda study, the overall data was similar; with 27% (870 individuals) reporting an injury related surgical condition in their lifetime, however only 7% (228 individuals) stated that this was in the last year.

In both Rwanda and Sierra Leone, falls were the most common cause of injury

(45% and 43% respectively). In Rwanda this was followed by animal related injuries (16%) and weapons (11%), whereas in Sierra Leone stab/slash/cut injuries (29%) and burns (12%) followed. In Sierra Leone 69% of the injuries related to the extremities and in Rwanda this was 49%, followed in both countries by injuries to the face, head, neck. Although most injuries were related to falls, most fatal injuries were road traffic related (32% of the total deadly injury incidents) followed by falls (29%).

The Sierra Leone data was further analysed for non-traumatic musculoskeletal problems and a total of 256 (7%) had a non-traumatic problem related to orthopedics in their lifetime, with 236 (6%) in the past year and 209 (6%) had this as an active problem at the time of the survey. Adults and elderly were more likely to have these types of problems than children (OR respectively 2.65 and 9.38). Females were equally likely to have a non-traumatic musculoskeletal problem. Rural as opposed to urban residency was associated with greater likelihood of having a non-traumatic musculoskeletal problem (OR 1.44). In children these non-traumatic injuries were attributable to congenital deformities in 36%, and mass or growth in 28%. Acquired deformity was significantly less common in children (22%) than in adults (46%) or the elderly (73%), where the latter's most affected body part was the back (49%). Non-traumatic foot problems were prevalent in children (28%) as opposed to 19% in adults and 14% in the elderly. A total of 14 respondents (5.1% of the non-traumatic musculoskeletal problems) noted recurrent drainage from a specific site as a proxy for possible osteomyelitis.

## DISCUSSION

As noted from other work, traumatic injuries account for a large proportion of the global burden of disease.<sup>(6)</sup> The proportion of global deaths from injuries was estimated at 9.6% in 2010 with a 46% rise in proportion of deaths due to road traffic injuries as well as to falls.<sup>(7)</sup> Secondary to the barriers to access to health care, 91% of global injury related deaths occur in Low- and Middle-Income Countries.<sup>(8)</sup> The SOSAS results from Sierra Leone and Rwanda highlight that injuries as well as non-injury related musculoskeletal conditions are significant burdens to the population. It is also likely that similar prevalence of orthopedic conditions exist in other Low- or Middle-Income Countries. Community-based surveys from Ghana on injuries had similar findings; it also stated that falls are associated with a high burden of disability.<sup>(9)</sup> Road traffic injuries have been further evaluated in Tanzania, with about 33 / 1000 person years, or 3.3% of the population in Dar Es Salaam annually involved in a road traffic incident and in need of surgical (orthopedic) evaluation.<sup>(10)</sup>

Population data on specific orthopedic conditions in Low- and Middle-Income Countries is limited. Some hospital and surgical camp related data is available for osteomyelitis; for example from a random assessment of an orthopedic clinic in Uganda which found that 10% of their evaluations were related to osteomyelitis.<sup>(11)</sup> A hospital extrapolation of the incidence of clubfoot estimated clubfoot to be present in 1.2 per 1000 live births.<sup>(12)</sup> Knowing the prevalence of these specific conditions in a hospital assists the hospital manager in logistics and focus but might not give the correct reflection of what is happening in the population.

As shown in this article, community surveys can elicit information on surgical and orthopedic need. However, these surveys are not perfect by any means. The SOSAS study, recently validated in Nepal<sup>(13)</sup>, relies on self-reporting by respondents which is subjective to recall, interviewer's bias and misinterpretation. Furthermore specific diagnoses are not collected which might frustrate the clinician who is ready for action with a scalpel during a short-term surgical camp. However, it does start one to think about how to strengthen health systems in a sustainable way for injured and disabled patients. Resources must be provided for prevention, therapeutics and rehabilitation. Action is needed in traffic safety campaigns, pre-hospital management as well as capacity and know-how in the medical setting. Obviously, this asks for commitment from governments and global health agencies, and for those organizations the uncovering of the burden for the population via epidemiological data might make a difference.



REINOU S. GROEN MD, MIH, PHD  
RESIDENT GYNECOLOGY AND OBSTETRICS AT JOHN HOPKINS  
HOSPITAL  
RSGROEN@HOTMAIL.COM

## REFERENCES

1. Groen RS, Samai M, Petroze RT, et al. Pilot testing of a population-based surgical survey tool in Sierra Leone. *World J Surg.* 2012 Apr; 36(4):771-4. doi: 10.1007/s00268-012-1448-9.
2. Groen RS, Samai M, Stewart K-A, et al. Enumerator evaluation of a population-based survey of surgical need in Sierra Leone: lessons for further use. *Bulletin of the Netherlands Society for Tropical Medicine and International Health.* 2013 -4 WEB page 10.
3. Petroze RT, Joharifard S, Groen RS, et al. Injury, Disability and Access to Care in Rwanda: Results of a Nationwide Cross-Sectional Population Study. *World J Surg.* 2014 May 28. [Epub ahead of print]
4. Stewart KA, Groen RS, Kamara TB, et al. Traumatic injuries in developing countries: report from a nationwide cross-sectional survey of Sierra Leone. *JAMA Surg.* 2013 May;148(5):463-9. doi: 10.1001/jamasurg.2013.1341.
5. Elliott IS, Groen RS, Kamara TB, et al. The Burden of Musculoskeletal Disease in Sierra Leone. In press for *Clinical Orthopedics and Related Research.*
6. Department of Injuries and Violence Protection Noncommunicable Diseases and Mental Health Cluster World Health Organization. The injury chart book: a graphical overview of the global burden of injuries. [whqlibdoc.who.int/publications/924156220x.pdf](http://whqlibdoc.who.int/publications/924156220x.pdf). Published 2002.
7. Lozano R, Naghavi M, Foreman K, et al. (2012) Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 380(9859):2095-2128.
8. World Health Organization (2010) Injuries and violence: the facts. WHO, Geneva.
9. Mock CN, Abantanga F, Cummings P, et al. Incidence and outcome of injury in Ghana: a community-based survey. *Bull World Health Organ.* 1999; 77(12):955-964.
10. Zimmerman K, Mzige AA, Kibatata PL, et al. Road traffic injury incidence and crash characteristics in Dar es Salaam: a population-based study. *Accid Anal Prev.* 2012; 45:204-210.
11. Stanley CM, Rutherford GW, Morshed S, et al. Estimating the healthcare burden of osteomyelitis in Uganda. *Trans R Soc Trop Med Hyg.* 2010 Feb;104(2):139-42. doi: 10.1016/j.trstmh.2009.05.014. Epub 2009 Aug 25.
12. Pirani S, Naddumba E, Mathias R, et al. Towards effective Ponseti clubfoot care: the Uganda Sustainable Clubfoot Care Project. *Clin Orthop Relat Res.* 2009 May; 467(5):1154-63. doi: 10.1007/s11999-009-0759-0. Epub 2009 Mar 24. Review.
13. Gupta S, Shrestha S, Nagarajan N et al. Surgical care in Nepal: Conditions, preventable deaths, procedures and validation of a countrywide survey. 2014.



# FEASIBILITY AND BARRIERS OF ORTHOPEDIC SURGERY IN LOW-INCOME COUNTRIES, ESPECIALLY THE CLUBFOOT

In this paper I will focus on the (financial) barriers of orthopedic surgery in Low-Income Countries. I will focus on the treatment of clubfoot, but comparable problems arise for other diseases or injuries. A clubfoot is a common disorder (1:1000 births) which if left untreated will result in a child growing up with a disability that causes societal stigma, reduces mobility, and threatens their potential productivity. This loss of productivity and lifelong income is much higher than the relatively low treatment costs if the treatment starts before the walking age. With a timely and correct treatment the foot will be almost normal. The Ponseti treatment provides a foot, in over 95% of the cases, which is completely functional and pain free if started before the walking age. However, most of the studies with this high amount of successful treatment are from industrialized countries.<sup>(1,2,3,4)</sup> There are, however, some good publications about introducing this technique and its barriers in LMICs (Low- and Middle-Income Countries) in Asia<sup>(5,6,7,8)</sup>, South America<sup>(9,10,11)</sup> and Africa.<sup>(12)</sup>

Given this relatively simple and cheap treatment the question arises why the neglected clubfoot still exists.

## BARRIERS

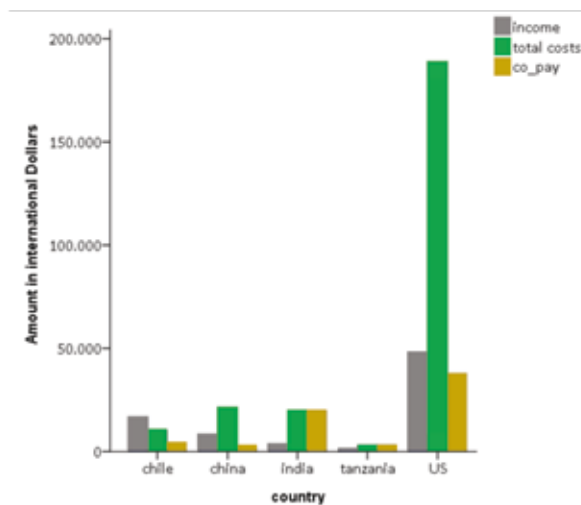
Barriers are known to be different between different countries, but also within countries<sup>(6,7,9)</sup>. I treat clubfoot patients in Indonesia both in Sumatra and Bali and especially the difference in beliefs regarding the cause of the deformity is striking. In Bali the main religion is Hindu and the cause of the clubfoot is often described as “supernatural” or “given by God” and the first treatment parents search for is the holy man, especially to prevent the next child from a disability, not necessarily for the treatment of this child.<sup>(13)</sup> These presumed misdeeds of the family together with societal stigma can cause a barrier for the caregivers to seek or continue the treatment. Other known barriers are lack of physician, education and resources, lack of physical access to health care, the family situation and the

physical distance to the place of treatment.<sup>(9)</sup> It is important to realize that many factors are interrelated: patients from rural areas have to travel farther, have a lower income, don't get any income for the days that they have to go to hospital, and in general they are more religious compared to people from urban areas. Two more important differences as compared to the (over)developed countries are the financial and social burdens for a family when their child is not able to work or to marry and start a family of its own. Especially girls with a physical handicap have difficulty in finding a partner<sup>(5)</sup> and our experience in a large rehabilitation clinic showed that quite often the patients find their partner in the clinic and start a family with two physically disabled parents. In most publications footwear is hardly mentioned<sup>(9)</sup> and a person with a treated clubfoot who is able to walk on custom-made shoes in my home country might not be able to walk barefoot or with flip flops which is the custom in most of the Low-Income Countries.

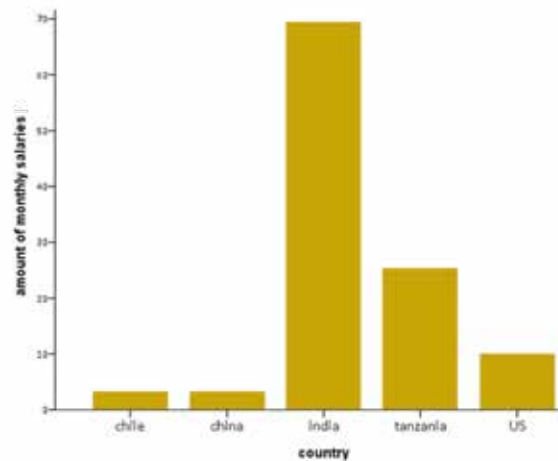
## FINANCIAL BURDEN

The barriers that undermine the outcomes of a Ponseti clubfoot programme are primarily poverty and noncompliance with the extended post-casting brace protocol.<sup>(12)</sup> A nice comparison has been made<sup>(14)</sup> between the treatment costs of complicated diabetic foot ulcers in four countries on four continents. The treatment costs were transformed to US dollars, taking into account the part of the costs which were covered by the insurance and which part the patients had to pay themselves (co-pay). When comparing the treatment costs per country, you see huge differences, but when you take into account which part of the treatment has to be paid for by the patients, the difference is even larger and the graphs change a lot (Figure 1). In general, the countries with the highest treatment costs also have insurances which cover up to 100% of the treatment costs. When you take into account the amount the patients have to pay themselves the differences between the countries become much larger. In this example the average salary for that specific country has been used, but in real life the incomes are much





**Figure 1** The average income (grey), total costs of treatment of a complicated diabetic foot ulcer (green) and the “co-pay”(the amount the patient has to pay for the treatment) in yellow



**Figure 2** The average amount of monthly income a patient has to pay for the treatment of a complicated diabetic foot ulcer

lower for the majority of patients. Figure 2 shows the amount of monthly income the patient has to pay for his treatment. Even when the treatment is free of charge or paid for by a third party, the costs for transport and missed working days form a barrier, although there is a large difference between countries. For example in the Netherlands all treatment costs are insured and the parents only have to pay the travel costs, which is in total less than 5% of their monthly income. In Indonesia parents pay up to 40% of their monthly salary only for travel costs to and from the hospital, and even though the treatment is free of charge, the parents cannot afford the travel expenses. In general the parents are “paid daily” so on the days they are in hospital there is no income for the family. This is a major reason for not initiating, or early withdrawal of, the treatment.<sup>(7)</sup>

The greater distance and travel time to the place of treatment for clubfoot, the later in life the treatment of clubfoot is started.<sup>(13)</sup> Physical accessibility of a treatment centre is also a barrier for the treatment and it also influences the adherence to the treatment which requires weekly visits in the casting phase and frequent follow-up during the bracing protocol. Non-compliance to follow-up leads to non-adherence to the bracing protocol which results in a 17-fold increased risk of relapse of the clubfoot.<sup>(10)</sup> Therefore travel distance to the place of treatment must be taken into consideration when improving clubfoot care worldwide. Specialized clubfoot clinics in rural areas were previously proposed as a solution for overcoming this barrier<sup>(9,15)</sup> and are very successful. In New Mexico, a 12.5 fold increase<sup>(9,15)</sup> in recurrence was found in patients from families who had an income less than 20,000 USD a year.<sup>(15)</sup> Withdrawal of the treatment in other settings has been reported to be between 14 and 57%.<sup>(3,11)</sup>

**SUPERNATURAL BELIEFS AND GENDER SELECTION**

In our own study<sup>(13)</sup> we found a 20 fold increased risk of a delayed treatment when the parents felt the clubfoot was caused by a higher spirit or as a punishment for their own poor behav-

our. Although there are almost twice as many boys than girls with clubfoot, about 80% of the patients we treat in Indonesia are boys, which raised the suspicion about gender selection, a phenomenon which is known from India, where girls are treated much later in life than boys<sup>(7)</sup>. Another astonishing phenomenon is the fact that some parents don’t want their child to be treated because they can get more money as a beggar with a handicapped child.<sup>(7)</sup>

**ASSOCIATION OR CAUSE?**

We looked at the age at the start of the treatment in 4 countries and found some associations.<sup>(13)</sup> We found a strong association between the age and the distance to the hospital, but also an association between distance and income. This can be explained by some general observations. On average the people in rural areas are lower educated and especially have lower health literacy. They also have a lower income and need more time (and money) to travel to the hospital. All the factors are interrelated and it is impossible to determine the most important factor.

Aviluca<sup>(15)</sup> found almost the same phenomena: of eighteen infants from a rural area who had early recurrence, fourteen were Native American. The families of these children, like those of all of the children with early recurrence, discontinued orthotic use earlier than was recommended by the physician. Discontinuation of orthotic use was related to recurrence, with an odds ratio of 120 in patients living in a rural area. Native American ethnicity, unmarried parents, public or no insurance, parental education at high-school level or less, and a family income of less than \$20,000 were also significant risk factors for recurrence in patients living in a rural area and are all interrelated.

**LACK OF INFORMATION**

The lack of information and skill of the doctor is another barrier<sup>(10)</sup> and the public opinion about clubfoot also influences the parents in seeking treatment for their children.<sup>(8,11)</sup> Several studies found a difference between the awareness of treatment



possibilities in different countries and especially the difference between urban and rural areas where health literacy is, on average, lower in rural areas.<sup>(7)</sup> We also experienced that the local community was not aware of treatment possibilities for clubfoot and a lot of patients are referred by priests or local NGOs, often from abroad. Maybe in the future this information could be provided by digital means. Clinicians with the appropriate skills and training are an important resource in

delivery of an intervention, and a number of authors studying both surgical and Ponseti techniques reported that practitioners' lack of skill impacted negatively on the outcomes of treatment.<sup>(9,11)</sup> In some countries there is no integrated treatment protocol for clubfoot in the health care system nor the medical education. Furthermore it is not integrated in the education of obstetricians and midwives, the key health care providers for early recognition and referral.<sup>(8)</sup> Lu et al.<sup>(6)</sup> found that more than half of the treating physicians pointed at a lack of awareness of early recognition.

Surgical correction of a clubfoot is provided by an orthopedic surgeon; the Ponseti and some conservative techniques could be provided by clinicians with a lower level of qualification, such as physiotherapists and clinical officers.<sup>(3)</sup> In many settings, non-physician practitioners are primarily responsible for the casting phase of treatment, particularly in areas with a shortage of physicians.<sup>(12)</sup>

There are some nice examples of introduction of the technique through non-physician health care workers in Malawi<sup>(16)</sup> and Uganda.<sup>(12)</sup> Combined teams with both orthopedic surgeons and non-physicians are used in India, Nepal and Vietnam.<sup>(8,17)</sup>

Given that contextual factors play an important role in determining the outcomes of treatment, these too must be addressed in future studies to find ways of overcoming barriers posed by the context in which the intervention is provided.<sup>(3)</sup>

#### THE FUTURE CAN BE BRIGHT

Every year about 150,000 children are born with a clubfoot worldwide, about 80% of whom in Low- or Middle-Income Countries. The majority of these feet are not treated leaving the child disabled for the rest of its life. We as a community should try to find and overcome the barriers to treat these patients, because we have a relatively easy, cheap and highly cost-effective treatment option which can be given by trained non-physicians supervised by an interested medical doctor who is able to perform a percutaneous tenotomy. With a relatively simple treatment we can change the prognosis from a serious disability for life to an almost normal foot. Given that poverty and beliefs of supernatural causes for the clubfoot are important reasons for delay in the start of treatment, these factors should be addressed for the local situation when introducing the Ponseti technique.

The concept of small treatment centres in rural areas has been proven to be highly effective in several countries and should be the mainstay for early recognition, treatment and especially

education and adherence to the treatment<sup>(5,15)</sup> as noncompliance and distance to the treatment centre<sup>(7)</sup> are the most important reason for failure. A good example of a national programme supported by orthopedic surgeons and physiotherapists from abroad is "walk for life" in Bangladesh which started in 2009 and has treated over 18,000 clubfoot patients nationwide so far and a similar project has just started in Myanmar.<sup>(5)</sup>

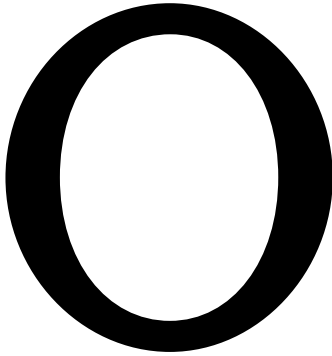


HUUB J.L. VAN DER HEIDE, MD PHD  
 ORTHOPEDIC SURGEON-EPIDEMIOLOGIST  
 LEIDEN UNIVERSITY MEDICAL CENTER LEIDEN, THE NETHERLANDS  
 HUUB.VANDERHEIDE@TISCALI.NL

#### REFERENCES

1. Jowett CR, Morcuende JA, Ramachandran M. Management of congenital talipes equinovarus using the Ponseti method: a systematic review. *J Bone Joint Surg Br.* 2011 Sep;93(9):1160-4.
2. Morcuende JA, Dolan LA, Dietz FR et al. Radical reduction in the rate of extensive corrective surgery for clubfoot using the Ponseti method. *Pediatrics.* 2004 Feb;113(2):376-80.
3. Owen RM, Kembhavi G. A critical review of interventions for clubfoot in low- and middle-income countries: effectiveness and contextual influences. *J Pediatr Orthop B.* 2012 Jan;21(1):59-67.
4. Dereymaeker G, Witbreuk M. Treatment of the clubfoot in low- and middle-income countries. *MT, Bulletin of the Netherlands Society for Tropical Medicine and International Health* 2014; 52, no. 4, Dec. (this issue).
5. Ford-Powell VA, Barker S, Khan MS et al. The Bangladesh clubfoot project: the first 5000 feet. *J Pediatr Orthop.* 2013 Jun;33(4):e40-4.
6. Lu N, Zhao L, Du Q et al. From cutting to casting: impact and initial barriers to the Ponseti method of clubfoot treatment in China. *Iowa Orthop J* 2010;30:1-6.
7. Gadhok K, Belthur MV, Aroojis AJ et al. Qualitative assessment of the challenges to the treatment of idiopathic clubfoot by the Ponseti method in urban India. *Iowa Orthop J.* 2012;32:135-40.
8. Wu V, Nguyen M, Nhi HM et al. Evaluation of the progress and challenges facing the Ponseti method program in Vietnam. *Iowa Orthop J.* 2012;32:125-34.
9. Boardman A, Jayawardena A, Oprescu F et al. The Ponseti method in Latin America: initial impact and barriers to its diffusion and implementation. *Iowa Orthop J.* 2011;31:30-5.
10. Nogueira MP, Fox M, Miller K et al. The Ponseti method of treatment for clubfoot in Brazil: barriers to bracing compliance. *Iowa Orthop J.* 2013;33:161-6.
11. Palma M, Cook T, Segura J et al. Barriers to the Ponseti method in Peru: a two-year follow-up. *Iowa Orthop J.* 2013;33:172-7.
12. Van Bosse HJ. Ponseti treatment for clubfeet: an international perspective. *Curr Opin Pediatr.* 2011 Feb;23(1):41-5.
13. Van Wijck S, Oomen M, van der Heide HJ. Unpublished data, manuscript in preparation 2014.
14. Cavanagh P, Attinger C, Abbas Z et al. Cost of treating diabetic foot ulcers in five different countries. *Diabetes Metab Res Rev.* 2012 Feb;28 Suppl 1:107-11.
15. Avilucea FR, Szalay EA, Bosch PP et al. Effect of cultural factors on outcome of Ponseti treatment of clubfeet in rural America. *J Bone Joint Surg Am.* 2009 Mar 1;91(3):530-40.
16. Tindall AJ, Steinlechner CW, Lavy CB et al. Results of manipulation of idiopathic clubfoot deformity in Malawi by orthopaedic clinical officers using the Ponseti method: a realistic alternative for the developing world? *J Pediatr Orthop.* 2005 Sep-Oct;25(5):627-9.
17. Nguyen MC, Nhi HM, Nam VQ, Thanh do V, Romitti P, Morcuende JA. Descriptive epidemiology of clubfoot in Vietnam: a clinic-based study. *Iowa Orthop J.* 2012;32:120-4.

# Non-tuberculous chronic osteomyelitis in Low- and Middle-Income Countries



steomyelitis is a very common problem in Low- and Middle-Income Countries (LMICs) as a result of exposure to multiple organisms, endogenous or hematogenous (children) as well as exogenous (adults: infected implants). Intravenous antibiotics can be curative in the acute stage of an endogenous infection (the first 36 hours), but antibiotics are not always available and the patients are seen later. Immediately after the first 36 hours a combination of debridement and antibiotics is mandatory. However, once the infection has become chronic other strategies are required (for instance: implant removal). In children it is advisable to wait for 8 months, as spontaneous resorption is possible, even resorption of sequestrae. Moreover, it is advisable to wait for the formation of an involucrum: living bone which bridges the infected area, so that the necrotic tissues can be safely removed. Older people might simply “live” with their fistula, rather than being exposed to a series of operations; lifelong suppressive antibiotics may be indicated. Generally speaking, the first question should always be: “Am I going to improve this patient?” Infected implants can be left in place as long as they provide stability, leading to bone union. In all cases the patient should know that recurrences are frequent and that often 3 or 4 reinterventions can be expected.

## INCIDENCE

Epidemiological data on osteomyelitis in LIMCs is scarce. Incidence increases with concomitant malnutrition or

immunosuppression, associated with parasitic infection. Also osteomyelitis is often misdiagnosed or undertreated. The increase in trauma, notably from road traffic accidents, has resulted in an increase in open fractures and their complications.<sup>(1)</sup> Therefore, osteomyelitis remains an important problem with important impact on mortality, morbidity and quality of life.

## ORIGIN AND CLINICAL FINDINGS

The origin of osteomyelitis can be endogenous (= hematogenous) or exogenous. Osteomyelitis can be acute, subacute or chronic.

### ENDOGENOUS (HEMATOGENOUS) OSTEOMYELITIS (MOSTLY CHILDREN)

Acute osteomyelitis is characterized by pain, lethargy, fever (often deemed as caused by malaria), and local inflammatory signs. In Africa mainly the infants are exposed (poorly groomed umbilical cord; drips for several weeks). Staphylococcus aureus is responsible in the majority of cases, but its preponderance is declining, in favour of Gram negatives. The proximal metaphyses of the femur and tibia are the areas of choice, but the infection can extend towards the diaphysis. In infants up to the age of 12 months, capillaries cross the growth plate and can therefore cause septic arthritis. In the older child these capillaries no longer exist, but an intracapsular metaphysis can also allow the infection to spread to the joint. This is the case for the proximal humerus, the proximal radius and the proximal femur.

Chronic osteomyelitis arises as a result of inadequate treatment, and is already established after 36 hours. The tibia is most often involved, followed closely by the femur. The periosteum will form an envelope of living bone (Figure 1), the involucrum, around the medullary space in order to separate it from the rest of the bone. This envelope thus pre-

vents the dispersion of infected emboli throughout the body, but at the same time also prevents antibiotics to penetrate into the marrow. The involucrum bridges the infected area, thus allowing safe removal of all necrotic bone and sequestra. Osteomyelitis lasts a lifetime, because one is never sure that it is completely eradicated. Long remissions can alternate with periods of exacerbation. The term “years without relapse” is therefore more accurate than the term “cure”. Differential diagnosis should always include TBC, Ewing sarcoma and Sickle Cell disease. A fistula can always lead to malignant degeneration.

Subacute osteomyelitis presents as vague pain and a mild fever for 1 to 3 months, after which it becomes chronic. The subacute form is rising in numbers, also in Africa, at the expense of the acute form, probably because antibiotics are given more easily. A special form of subacute osteomyelitis, under 25 years of age, is the Brodie abscess (Figure 2). In 40% of cases it forms after antibiotic therapy, which has tempered the evolution. Treatment consists of debridement and antibiotics. There is only granulation tissue, no pus.

### EXOGENOUS OSTEOMYELITIS (MOSTLY ADULTS)

Exogenous osteomyelitis forms by adjacency of a wound, foreign body, an osteosynthesis or arthroplasty. As the two latter are also on the rise in LIMCs (just like in developed countries), osteomyelitis as a result is becoming more and more frequent. In Africa it is less frequent than the hematogenous form. Here the infection is often more superficial, which improves the prognosis.

## CLASSIFICATION

The classification of Cierny-Mader<sup>(2)</sup> is universally accepted, at least for adults (figure).

Type I: medullary osteomyelitis.

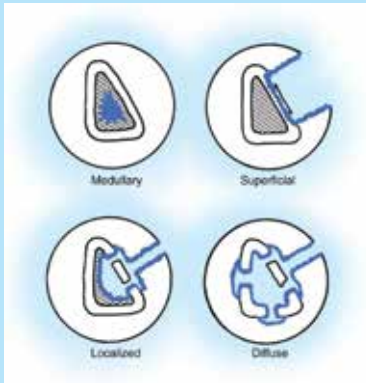


Figure 1



Figure 2



Type II: superficial osteomyelitis : involves only the cortical bone and most often originates from direct inoculation or contiguous focus infection.

Type III: localized osteomyelitis : involves both cortical and intramedullary bone. In this stage the bone remains stable and the infection does not involve the entire bone diameter.

Type IV: diffuse osteomyelitis: involves the entire thickness of the bone, with loss of stability, as in infected non-union.

This classification also takes into account the resistance of the patient:

A = normal host resistance.

B = locally reduced resistance (Bl) (e.g. vascular ischemia) or systematically (B2) (e.g. diabetes).

C = severely compromised patient; not a good candidate for surgery because the intervention could be worse than the disease.

#### WHEN TO OPERATE

One has to consider a conservative attitude when there is neither pain nor fistula.

In children a waiting period of 8 months after the acute phase is a good option<sup>(3)</sup>, except if a joint is involved. In the first place because the sequestrum can resorb spontaneously. Secondly because the infection will become more demarcated.

Thirdly, because an involucrum takes time to form; it will ensure continuity, so that all necrotic tissue can be removed.

In older patients, not fit to undergo operative treatment, suppressive antibiotic therapy can be considered. A fracture should be allowed to heal first.

In most other cases surgical debridement is the key to the treatment. However, a careful risk/benefit analysis should be performed on the basis of the complete medical history beforehand. In doubtful cases, one should consider referring the patient to a colleague with extensive expertise in treating orthopedic infections.

#### HOW TO OPERATE

Methylene blue can be injected into the fistulae, 24 hours before surgery, in order to aid complete resection of all infected soft tissue: the necrotic tissues remain blue because they cannot eliminate the product.

Pneumatic tourniquet, after hyperextension of the limb, without the use of an Esmarch bandage: in order to facilitate the paprika sign: bleeding bone at decoration with a bone biting forceps.

Debridement and sequestrectomy should include all necrotic (blue) bone until one sees bleeding bone (paprika sign).<sup>(4)</sup> Lavage is important: "dilution is the solution to pollution". Plates and screws can be left in situ if they stabilize an unhealed fracture.

Dead space can be filled by muscle (saucerization), but nowadays other alternatives are coming on the market, like antibiotic-laden bone cements (Cera-ment®, Bonesupport, Lund, Sweden)<sup>(5)</sup> and bio-active glass (Bonalive®, Bonalive, Turku, Finland).<sup>(6)</sup> These are, however, still expensive options and not yet readily available in developing countries. Antibiotic-loaded beads still have their place in the treatment but necessitate removal in a second operation. The author does not advise to leave them in because over time all antibiotics will have diluted out and the beads will become foreign material and covered by biofilm.

Fistulae should be excised and sent for anatomopathology. However, some authors simply curet them or leave them untouched, especially in dangerous areas.

Wounds should be closed primarily if possible. If impossible to do so, granulation must be promoted as much as possible, either by appropriate wound care or open techniques like the Papineau technique.<sup>(7)</sup> Flaps are also possible.

Theoretically, no antibiotics should be administered until deep tissue cultures are taken, in order to determine the causative germ and its sensitivity to antibiotics. But this is rarely possible in Africa. So, if cultures are not possible a combination of amoxicilline/clavulanic acid with gentamycin will cover most Gram+ and Gram- germs, as well as anaerobes. They should be continued



for a total of six weeks (2 weeks IV and 4 weeks orally).

#### PROGNOSIS

Recurrence is always possible during the remaining lifetime, but most often in the first postoperative year. Generally the recurrence rate is about 40% (also up to 30% in the western world).<sup>(8)</sup> Thus the initial healing rate is in the order of 60%. The experience of the surgeon is the only really significant factor, especially as regards the complete debridement. But according to Martini<sup>(3)</sup> the cure rate rises to 95% if reintervention is performed (up to 4 times!). Also involvement of plastic surgeons through muscle flaps, local or free, increases this percentage, so healing rates above 90% are achieved more often than in the past.<sup>(2)</sup> Factors favouring the healing are: female gender, location in the humerus, subacute onset, delay in presentation of less than one year, normal or elevated lymphocytosis, normal or lowered polynucleosis, small involucrum size and above all: the experience of the surgeon. Results can be further improved by total eradication, but without weakening the bone, causing fractures. If necessary, administration of combined antibiotic therapy and also stopping the smoking habits of the patient.

#### CONCLUSION

Osteomyelitis continues to be a pathology that causes much morbidity and disability in LMICs, as well as in the western world. Adequate diagnosis and treatment can greatly improve outcome and therefore the aim should be to treat

this condition as quickly and thoroughly as possible.



JAN GEURTS, MD, ORTHOPEDIC SURGEON  
 MAASTRICHT UNIVERSITY MEDICAL CENTRE  
 J.GEURTS@MUMC.NL

MICHEL HOOGMARTENS, MD, ORTHOPEDIC SURGEON  
 CATHOLIC UNIVERSITY LEUVEN, ARTSEN ZONDER VAKANTIE  
 MICHELHOOGMARTENS@HOTMAIL.COM

#### REFERENCES

1. Museru LM, Leshabari MT, Grob U et al. The pattern of injuries seen in patients in the orthopaedic/trauma wards of Muhimbili Medical Centre. East Cent Afr J Surg 1998;4:15-21.
2. Cierny G 3rd, Mader JT, Penninck JJ. A clinical staging system for adult osteomyelitis. Clin Orthop Relat Res. 2003;414:7-24.
3. Martini M. The treatment of chronic hematogenic osteomyelitis. Acta Orthop Belg 1981;47:79-84.
4. Tetsworth K, Cierny G 3rd. Osteomyelitis debridement techniques. Clin Orthop Relat Res 1999; 360:87-96.
5. Ferguson JY, Dudareva M, Riley ND et al. The use of a biodegradable antibiotic-loaded calcium sulphate carrier containing tobramycin for the treatment of chronic osteomyelitis: a series of 195 cases. Bone Joint J 2014; 96-B: 829-36.
6. Lindfors NC, Hyvönen P, Nyyssönen M et al. Bioactive glass S53P4 as bone graft substitute in treatment of osteomyelitis. Bone 2010;47:212-8.
7. Panda M, Ntungila N, Kalunda M et al. Treatment of chronic osteomyelitis using the Papineau technique. Int Orthop 1998;22:37-40.
8. Tice AD, Hoaglund PA, Shoultz DA. Risk factors and treatment outcomes in osteomyelitis. J Antimicrob Chemother 2003;51:1261-8.

#### COLOPHON

**MT Bulletin of the  
 Netherlands Society for  
 Tropical Medicine and  
 International Health**

ISSN 0166-9303

CHIEF EDITOR  
 Hans Wendte

EDITORIAL BOARD  
 Joost Commandeur  
 Esther Jurgens  
 Steven Smits  
 Ed Zijlstra

LANGUAGE EDITING  
 Elsa van Gelderen

COVER PHOTO  
 Hanneke de Vries

DESIGN  
 Mevrouw VANMULKEN  
 Amsterdam

© NVTG 2014



# Treatment of the clubfoot in Low- and Middle-Income Countries

**T**he clubfoot is most often a congenital deformity that occurs in 1 to 2 of every 1,000 neonates. Ideally, treatment of the clubfoot is started at birth, as is done in the modern world. However, with the limited finances and access to medical care and /or hospital resources in Low- and Middle-Income Countries (LMICs), the majority of the clubfoot patients in the LMICs are inadequately treated or neglected.

Neglected clubfoot can have a dramatic effect on the quality of life. Physical impairment results in decreased ambulation and disability will lead to dependency in activities of daily living with significant economic impact on both the family and the village. Furthermore, the visible physical and functional differences in individuals with clubfoot are associated with considerable social stigma. Children with locomotor disability are less likely to be able to access education and a proper job. Girls are even more vulnerable to social, physical and sexual abuse, and are less likely to achieve education than boys with the disability.

The deformity affects boys twice as much as girls, and twice as many cases are bilateral.

## PATHOLOGY

The pathology affects especially the soft tissue around the posterior and medial site of the hindfoot. There is always stiffness, but some feet are stiffer than others. The deformity of the clubfoot when not treated is progressively aggravating over lifetime.

The deformity consists of an Equinus and Varus position in the hindfoot and Cavus –Adductus deformity in the midfoot.

## DIAGNOSIS

Early recognition of the deformity and correct diagnosis is of the greatest importance: congenital or acquired clubfoot. A classification and scoring of the foot is done and treatment has to start as soon as possible.

## THE PRIMARY TREATMENT

The primary treatment of the clubfoot is nonsurgical and consists of specific manipulations of the foot followed by a specific method of casting during 5 to 6 weeks in progressive correction as described by Ponseti. This casting method needs training of the local paramedic staff.

If insufficient dorsiflexion of the foot is obtained after 5 to 6 weeks of progressive corrective casting a percutaneous tenotomy of the Achilles tendon is necessary, followed by a further minimum of 3 weeks of casting.

The casting period has to be followed by a specific method of bracing for up to 3 years to avoid recurrences. If relapses occur within the first 3 years it is mainly due to the brace not having been worn !! Also local orthopedic technicians need to be trained to make and be able to adapt these braces while the child is growing rapidly.

As a non-invasive technique for the management of congenital clubfoot, the Ponseti method has been proven to be a superior method of correcting clubfoot deformity and avoids major surgical intervention. With this method, a long-term study by Cooper and Diez reported 78% good and excellent results at a minimum follow-up of 25 years.

## THE TREATMENT OF THE NEGLECTED CLUBFOOT

The treatment of the neglected clubfoot is surgical, to a high percentage, and becomes more difficult the older the patient is. The results of the surgery highly depend on the age of the patient and the stiffness of the non-treated or undertreated foot (recurrence).

Under the age of 5 years the surgical procedure consists mostly of a release of the posterior medial soft tissues and capsular structures. The reduction has to be fully and is best held with a K-wire (figure 4). Immediate postoperative POP casts during 6 weeks are given, followed by bracing of the feet and lower limb in 10° of dorsiflexion, external rotation and abduction overnight and up to 3 years.



Figure 1



Figure 2



Figure 3



Figure 4

Seldom bony procedures are necessary before the age of 5. In age group 5 to 10 years soft tissue procedures may need to be supplemented by osteotomies of the calcaneum, navicular or cuboid bones (figure 2).

In adolescence surgery will include soft tissue release as well as bony procedures. A triple arthrodesis combined with Achilles lengthening, rotational skin flap will often offer the best possibility of tridimensional correction to obtain a plantigrade foot (figure 1 and 3).

In the very severe adult neglected clubfoot, even a triple arthrodesis will not be able to give enough correction, due to vascular impairment and a talectomy or tibio-calcaneal fusion may then provide an adequate solution.

A skin rotation flap needs to be considered at any time to improve the reduction of the foot when the medial skin is withholding, as it will also help the wound closure.

Postoperative casting is very important until full correction and healing of the bony procedure are obtained. Maintaining the correction with a brace and special footwear is just as important as the surgery.

In the paralytic feet tendon transfers should not be forgotten, and will be added to the above described procedures.

### CONCLUSION

A clubfoot has to be recognized as soon as possible and treatment should ideally be started at birth by conservative methods. The Ponseti management is the first choice treatment, in the developed as well as in the developing countries.

In childhood treatment concerns mainly soft tissue releases. In adolescence surgery is the better option, with triple arthrodesis being one of the important procedures to obtain a plantigrade foot.

These surgical procedures are difficult and need skilled surgeons and are not free from complications!!! Education of trained paramedical people and bedside training of doctors in

the surgical procedures together with specific extended postoperative care, will help to get the same good results in the care of the clubfoot as in the developed countries where the deformity hardly exists after the age of one year.



GRETA DEREYMAEKER, MD,PHD, ORTHOPEDIC SURGEON  
KATHOLIEKE UNIVERSITEIT LEUVEN  
GRETADRM@SKYNET.BE

MELINDA WITBREUK, MD, ORTHOPEDIC SURGEON  
VUMC  
MMWITBREUK@ME.COM

### FURTHER READING

Clubfoot: Ponseti Management, 2009, third edition, available free from [www.global-help.org](http://www.global-help.org)

Pirani S, Naddumba E, Mathias R et al. Towards effective Ponseti clubfoot care-The Uganda sustainable clubfoot care project: Clin Orthop Relat Res 2009;467:1154-63.  
Ponseti IV, Treatment of congenital clubfoot. J. Bone Joint Surg.1992;74(3):448-54.  
Ponseti IV, Congenital clubfoot. Fundamentals of treatment, New York Oxford University Press 1996, available free from [www.ponseti.info](http://www.ponseti.info)

Ponseti IV, Clubfoot Management, J Pediatr Orthop 2000;20(6):699-700.

Cooper DM, Dietz FR, Treatment of idiopathic clubfoot: a thirty year follow-up note. J Bone Joint Surg Am 1995;77:1477-89.

Turco VJ, Resistant congenital clubfoot: one stage posteromedial release with internal fixation. A follow-up report of fifteen years experience. J Bone Joint Surg Am 1979;61:805-14.

Baxter Willis R, Al-Hunaishel M, Guerra L, et al. What proportion of patients need

extensive surgery after failure of the Ponseti technique for clubfoot? Clin Orthop Relat Res 2009;467:1294-97.

Bensahel H, Csukonyi Z, Desgrippes Y, et al. Surgery in residual clubfoot: one-stage medio posterior release 'a la carte.' J Pediatr Orthop 1987;7:145-8.

Pirani S, Zeznik L, Hodges D, Magnetic resonance imaging study of the congenital clubfoot treated with the Ponseti method. J Pediatr Orthop 2001;21:719-26.

Dyer PJ, Davis N, The role of the Pirani scoring system in the management of club foot by the Ponseti method. J Bone Joint Surg Br 2006;88:1082-4.

Mittal RL, The surgical management of resistant club foot by rotation skin flap and extensive soft tissue release. Int. Orthop 1987;11(3):189-92.



# BLOUNT'S DISEASE, BOWLEGS OF UNKNOWN ORIGIN AND WELL-KNOWN TREATMENT



**Figure 1** Clinical presentation of Blount's disease in a 5-year-old girl in Ghana

**B**lount's disease, bowlegs or tibia vara, is characterized by proximal tibial bowing and endotorsion. It is a well-known condition in North America and Africa. The aetiology is still unclear. Mechanical loading and genetic predisposition are possible causes. The treatment often requires surgical intervention such as a proximal tibial osteotomy.

The deformity can be unilateral as well as bilateral with an even distribution of approximately 50%.<sup>(1)</sup> Consequences of the deformity of the limb, besides the obvious cosmetic aspects, are further deformation of the leg with possible gait deviations and limb shortening. This can lead to early onset arthritis of the knee.<sup>(2)</sup> The disease involves the epiphysis, physis and metaphysis of the proximal tibia and results in a varus position, flexion and internal rotation of the lower limb (Figure 1). It was first described by Erlacher in 1917 and a more detailed description followed by W.P. Blount in 1937.

Based on the age of onset different types of Blount's disease can be distinguished. Onset of the disease before the age of 4 is named infantile Blount's disease. Onset after this age, late-onset, can be divided into a juvenile (onset between age four to ten) and an adolescent type (onset after ten years of age). A predisposition has been reported in children of African descent.<sup>(2)</sup>

Blount's disease is recognized on the conventional radiographs by the following typical features of the proximal tibia: tibia vara with the centre of rotation in the proximal epiphysis, metaphyseal beaking, apparent fragmentation of the medial metaphysis

adjacent to the epiphysis, straight lateral cortical wall of the proximal tibial metaphysis.<sup>(3)</sup> The radiographic progression of the disease can be classified according to Langeskiöld into six stages (Figure 2), ranging from mild involvement with a beaked medial metaphysis (Stage 1) to the presence of a bony bar (Stage 6). The classification is used to aid diagnosis, to monitor the progression and to guide treatment.

## DIFFERENTIAL DIAGNOSIS BOWLEGS

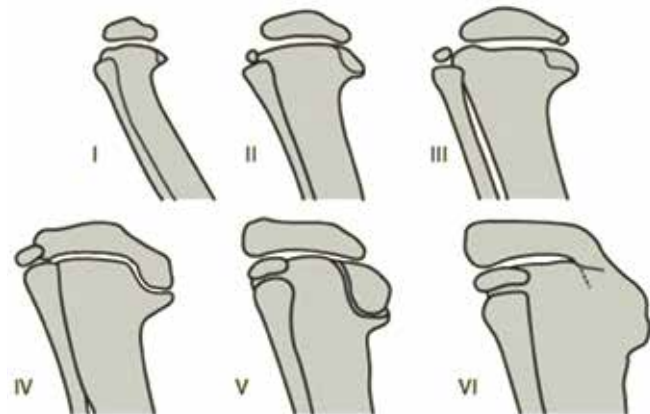
The combination of the varus deformity and the internal torsion of the tibia is a consistent finding in Blount's disease. This distinguishes Blount's disease from its main differential diagnosis in toddlers, the physiological genu varum, in which there is no increase of the internal torsion of the tibia. General conditions such as rickets can also cause varus deformity in the tibia but on the conventional radiographs Blount's disease causes a sharp angulation at the site of the epiphysis, indicating a focal epiphyseal problem. A more gradual bowing is seen in general conditions such as rickets. To differentiate between the two, blood chemistry may help by showing low serum calcium, low serum phosphorus and high serum alkaline phosphatase in Rickets and normal blood counts in Blount's disease.

## AETIOLOGY

The aetiology of Blount's disease remains unknown up to now, but different hypotheses have been proposed and are discussed below.

- INCREASED MECHANICAL PRESSURE ON THE KNEE JOINT  
Development of the disease as a consequence of increased





**Figure 2** Langeskiöld stages of infantile Blount's

- Stage I – Beaked metaphysis
- Stage II – Saucer shaped defect
- Stage III – Stepped defect
- Stage IV – Bent physal plate
- Stage V – Double epiphysis
- Stage VI – Medial physal bar

mechanical force is one of the most mentioned hypotheses of infantile Blount's disease. It is based on the observed correlation between Blount's disease and obesity. Furthermore Blount's disease is seen more often in children who walk at an earlier age. This theory, however, does not explain the existence of a unilateral occurrence of tibia vara or the high incidence in African countries where there is a low prevalence of obesity.<sup>(2,4)</sup>

- **NUTRITION**

Some studies show that children with vitamin D deficiency are at a higher risk of developing Blount's disease.<sup>(5)</sup> In a study conducted in Nigeria a variety of biochemical parameters in the serum of patients with Blount's disease was compared with healthy subjects. They did not find significant differences in calcium, inorganic phosphate or copper concentration. Serum zinc levels and alkaline phosphatase, however, were significantly decreased in Blount's.<sup>(6)</sup>

- **GENETICS & HEREDITY**

Since in different cases a familial occurrence was found and Blount's is more often seen in African and Afro-American children, a genetic component is also hypothesized. A genetic basis for Blount's disease is mentioned in some case reports. The reports show siblings with Blount's disease and no known risk factors, and healthy parents. The reports may lead in the direction of recessive inheritance.

- **INTRA-ARTICULAR CHANGES AND HISTOLOGY**

Magnetic Resonance Imaging (MRI) of the knee in patients with Blount's disease show a thicker layer of epiphyseal cartilage and increased height of the medial meniscus in the medial knee compartment. No difference was found with regards to the lateral meniscus. These macroscopic findings reflect the compensation mechanism of the medial down-sloping.

Histological analysis shows islands of densely packed hypertrophied chondrocytes, areas of acellular cartilage matrix and abnormal clusters of capillaries resulting in necrosis of the physal cartilage. There is disorganization of all structures on the medial side of the proximal tibial physis, but no bony bridges across the epiphysis are found.<sup>(7-11)</sup>

**TREATMENT OF BLOUNT'S DISEASE**

Very mild deformities may resolve without treatment but for slight varus deformities (stages 1-2 Langeskiöld) conservative treatment with bracing or by repetitive plaster correction can be started. The pressure is transferred to the lateral compartment of the knee, stimulating the epiphyseal growth in the medial compartment.

Surgery is advised in the more severe stages (stages 3 or 4 Langeskiöld). Hemi-epiphysiodesis (permanent or reversible) is used to slow the growth on the lateral side and thereby correcting the deformity by the patient's own growth. For reversible hemiepiphysiodesis the 8-plate (Orthofix) is used. The method is relatively easy, requires limited operative time,

limited operative access and allows postoperatively full weight bearing. A figure-of-8 device is screwed above and below the epiphysis of the proximal tibia on the lateral side thus correcting the varus misalignment by allowing faster growth on the medial side. The internal rotational deformity is not corrected. In Blount's disease a pretty high amount of implant failure is reported (26%).<sup>(12)</sup>

For the stages 5 and 6 different types of osteotomies are described. Opening- and closing-wedge osteotomies are both used, together with dome and Chevron-type osteotomies (V-type). Most of these osteotomies require internal fixation and the possibility of implant infection exists. Furthermore after consolidation implant removal is required. These techniques do not always successfully correct the rotational deformity that accompanies the angular, varus, deformity in this condition. The tibial W/M serrated osteotomy, first described in 1995 by Khermosh et al., enables simultaneous correction of the varus component as well as the torsional deformity, without the necessity for internal fixation.<sup>(13)</sup> The osteotomy is performed by making an M-shaped opening in the proximal tibia. Then the "teeth" of the M are disengaged and twisted correcting the varus and the rotational deformity. When the osteotomy is not stable a temporary Kirschner-wire can be introduced until the postoperative cast is set. A long-leg cast is worn for 8 weeks.

Besides the different osteotomies gradual corrections with external frames are described as well with the advantage of adjustability, early weight-bearing and the ability to lengthen the limb.<sup>(14)</sup> The disadvantages of this technique are a longer consolidation time and the need for expensive, complex devices. Complications include pin-track infections and postoperative neuropraxia. This technique appears to be more suitable for adolescents or adults in First World countries, because of the need for expensive devices and the pin-track problems.

#### COMPLICATIONS OF TREATMENT

After high tibial osteotomies the general complication rate is 13% and the recurrence rate is 57%.<sup>(15)</sup> Several complications have been described varying from non-union to nerve palsy. Specially the peroneal nerve is at risk in the lateral closing wedge osteotomies and in the corrections with an external frame. Non-union and delayed union occur often related to patient factors affecting his healing like sickle-cell anemia and malnutrition. Osteomyelitis can come about after wound healing problems or surgical site infections. The odds of suffering an infection will depend on the circumstances in which the patient is operated. Certainly we have to take into account the hygienic circumstances of the hospital and the general health of the patient. Other complications are malunion, compartment syndrome, deep venous thrombosis, hematoma.

#### RECURRENCE OF THE DEFORMITY

After appropriate surgical correction of the varus malalignment in children with Blount's disease sometimes the malalignment reoccurs even after years. The recurrence rate seems to be related to the preoperative severity of the varus and to being overweight. Since we do not know what causes the

disease and we do not treat the cause with the osteotomy the recurrence rate might be due to the on-going disease. Therefore monitoring of limb alignment and length is required until skeletal maturity. Future research should be focused on the underlying cause of Blount's.

#### CONCLUSION

Blount's disease is a well-defined deformity of the proximal tibia. It occurs mostly in children of African descent. It might be related to mechanical factors such as early walking age and obesity. Treatment is mainly surgical. Follow-up until skeletal maturity is mandatory.

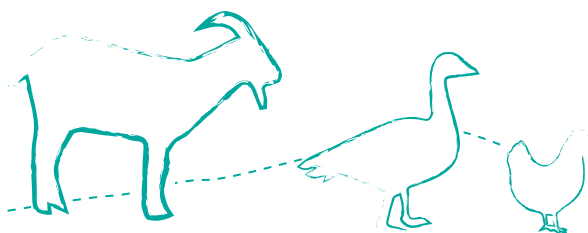


HELEEN M. STAAL MD, NANDI MEIJS

DEPARTMENT OF ORTHOPEDIC SURGERY, RESEARCH SCHOOL CAPHRI, MAASTRICHT UNIVERSITY  
MEDICAL CENTRE  
H.STAAL@MUMC.NL

#### REFERENCES

1. Birch JG, Blount disease. *J Am Acad Orthop Surg* 2013;21(7):408-18.
2. Sabharwal S, Blount disease. *J Bone Joint Surg Am* 2009;91(7):1758-76.
3. Langenskiöld A, Tibia vara. A critical review. *Clin Orthop Relat Res* 1989;246:195-207.
4. Langenskiöld A, Tibia vara: Osteochondrosis deformans tibiae: Blount's disease. *Clin Orthop Relat Res* 1981;158:77-82.
5. Montgomery CO, Young KL, Austen M, et al., Increased risk of Blount disease in obese children and adolescents with vitamin D deficiency. *J Pediatr Orthop* 2010;30(8):879-82.
6. Giwa OG, Anetor JL, Alonge TO, et al., Biochemical observations in Blount's disease (infantile tibia vara). *J Natl Med Assoc* 2004; 96(9):1203-7.
7. Martinez AG, Weinstein SL, Maynard JA, Tibia vara: report of an unusual case. *J Bone Joint Surg Am* 1992;74(8):1250-6.
8. Thompson GH, Carter JR, Late-onset tibia vara (Blount's disease): current concepts. *Clin Orthop Rel Res* 1990;255:24-35.
9. Thompson GH, Carter JR, Smith CW, Late-onset tibia vara: a comparative analysis. *J Pediatr Orthop* 1984;4(2):185-94.
10. Carter JR, Leeson MC, Thompson GH et al., Late-onset tibia vara: a histopathologic analysis. A comparative evaluation with infantile tibia vara and slipped capital femoral epiphysis. *J Pediatr Orthop* 1988;8(2):187-95.
11. Wenger DR, Mickelson M, Maynard JA, The evolution and histopathology of adolescent tibia vara. *J Pediatr Orthop* 1984;4(1):78-88.
12. Schroerlucke S, Bertrand S, Clapp J et al., Failure of orthofix eight-plate for the treatment of Blount disease. *J Pediatr Orthop* 2009;29(1):57-60.
13. Khermos O, Wientroub S, Serrated (W/M) osteotomy: a new technique for simultaneous correction of angular and torsional deformity of the lower limb in children. *J Pediatr Orthop B* 1995; 4(2):204-8.
14. Price CT, Scott DS, Greenberg DA, Dynamic axial external fixation in the surgical treatment of tibia vara. *J Pediatr Orthop* 1995;15(2):236-43.
15. Ferriter P, Shapiro F, Infantile tibia vara: factors affecting outcome following proximal tibial osteotomy. *J Pediatr Orthop* 1987;7(1):1-7.





# Surgery in rural areas: from simplicity to multitasking

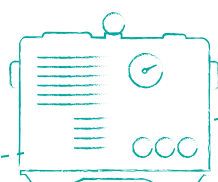
If you are an American soldier, shooting at foreign nationals in their own back yard, and they happen to shoot back, it must be comforting to know that after a brief satellite call, one of your private defence contractors can have a fully functional intensive-care unit with four respirators set up within a couple of hours. While you are drifting in and out of consciousness on your respirator you might consider that your country has spent a defence budget that would not only put a few men on Mars, but might have maintained the health services of any of the 30 poorest countries for several thousand years! That is: the health budget for those countries can be maintained at its current level for as long again as the Gregorian calendar has been counting AC years; the middle ages, renaissance, reformation, modern times all included.

Most of us have to make do with simpler means, and the poorer (or economically challenged) the country is, the less budget you will have available for each patient, and the more creative you will need to be.

In rural areas, Funding and Communications (including transport) are often the most difficult. Patients must walk or be carried for several hours, even days, to reach a health post, and will probably have used up all their available funding to reach there. Without a large support group or extended family most would not even attempt the journey, and it is worth considering the discussions that must have gone on before such an arduous journey is undertaken. I suspect that for most isolated rural communities, the various forms of western (as in occidental, not wild) surgery is an important reason they might attempt such a journey.

Once the patient reaches a health post offering western medical services, they may well find the required expertise or facilities are not available, so they must travel further if they are able. To finally end up in an understaffed and overstretched central hospital.

It makes sense to try to maintain some form of surgical services for common and simple conditions in the rural areas, and to train available personnel in those procedures.



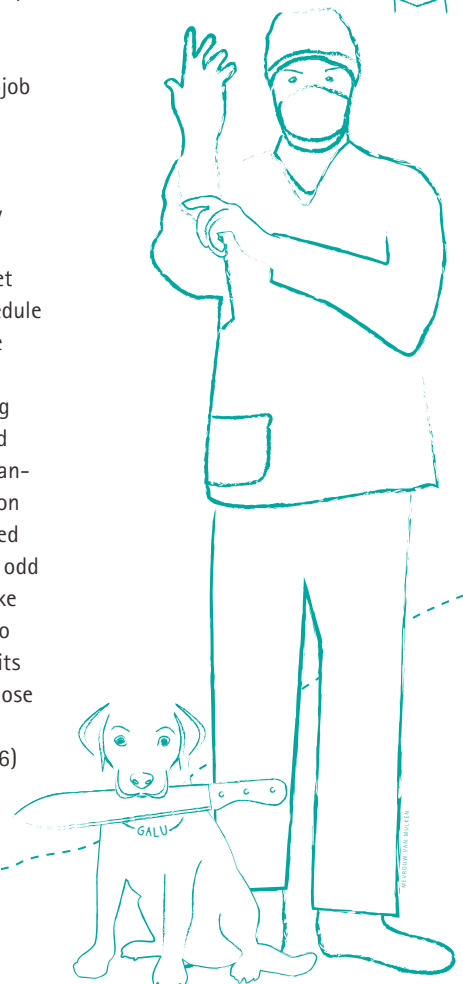
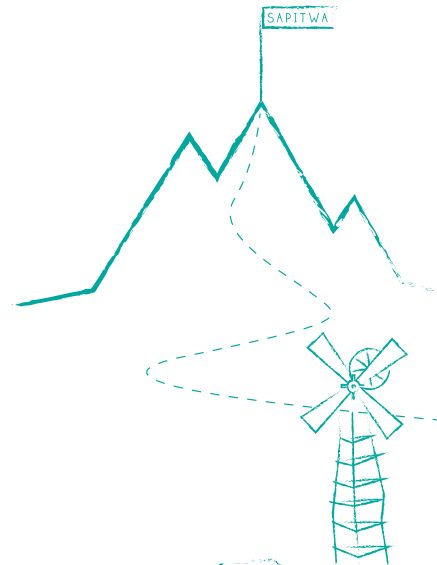
Notwithstanding the chronic desires of the WHO to think only in prevention, all but the most fortunate of citizens will still at one time or another require curative medicine or surgery. A child with a broken arm or strangulated umbilical hernia will not care that effective vaccines prevented her from ever having measles, whooping cough, diphtheria or polio; she just wants that arm fixed or the terrible stomach pain to stop.

So what can we offer in the rural setting?

1. Keep it simple – simple instructions, simple procedures, simple instruments,
2. Keep it safe – effective selection of procedures and patients,
3. Maintain short lines of communication to larger hospitals,
4. Make use of telephone or internet where available for information and consultations,
5. Programme regular visits by specialists to see problems and provide further on-the-job training.

All this is of course nothing new. It has been applied in Malawi since the early 60s when my father was for a time the only surgeon in the country, long before the medical school was set up. In spite of an impossibly busy surgical schedule at the Queen Elisabeth Hospital in Blantyre, he still managed to find time for regular district visits around the country, teaching and training registrars, clinical officers, tropical doctors and district medical officers, provide advice and planning for the Ministry of Health in the evening on his way home. He also ran a small farm, repaired the generators, windmills and cars, and on the odd weekend off would drive his large family to Lake Malawi for a weekend's fishing or to Mulanje to climb the plateau and peaks. Paying 'quick' visits to the district hospitals on the way, even on those outings. Multitasking was first defined shortly afterwards by the Oxford Dictionary (OED 1966) but that was probably a coincidence.

JOHANNES BORGSTEIN  
BORGSTEIN@GMAIL.COM





# Strengthening of the Sierra Leonean Health System by Implementing a Surgical Task Shifting Programme

**E**very year an estimated 234 million surgeries are performed worldwide of which only 3.5% of the total volume is done on the poorest one third of the world's population.<sup>(1)</sup> In 2008 in the governmental sector in Sierra Leone, there were only 21 specialists, five medical doctors (MD) and fourteen non-physician clinicians (NPCs). Three quarters of the health workers that perform surgery in the governmental institutions were located in the capital Freetown.<sup>(2)</sup> In a recent household survey about 25% of the respondents reported a surgical condition that needed attention and 25% of household members who died in the last year could have benefited from surgery.<sup>(3)</sup> With the introduction of free health care the demand for surgical intervention has increased.<sup>(4)</sup>

**O**ver the last five years, an average of twenty students have graduated from medical school in Sierra Leone.<sup>(5)</sup> Currently there are no possibilities to specialize in surgery or obstetrics within the country. Low production of MDs and few training opportunities contribute to vacant positions in surgery and obstetrics especially in the districts. An option to increase the surgical workforce for the district is to introduce the concept of task-shifting.

## TASK-SHIFTING

Task-shifting is the delegation of certain medical responsibilities to less specialized health care workers. Globally the concept gained attention for HIV treatment provided by NPCs, nurses and midwives.<sup>(6)</sup> Successful examples of task-shifting in Sierra Leone are the cataract operations done by ophthalmic nurses and the anesthetic care given by anesthesia nurses.<sup>(7)</sup>

Surgical task-shifting is the delegation of certain procedures from consultant specialists to MDs and from MDs to NPCs. The World Health Organization (WHO) recommends task-shifting to (high level) associate clinicians for manual placenta removal, vacuum extraction and cesarean sections if training and supervision are sufficient.<sup>(8)</sup>

Although the delegation of surgical tasks to non-specialized MDs has been widely implemented in West Africa, there is very little culture for task-shifting in surgery and obstetrics

to non-physicians. This is in contrast to the East side of the continent, where it is common practice. Many of the cesarean sections performed in district hospitals in East Africa are performed by non NPCs (Malawi 90%, Tanzania 84% and Mozambique 92%).<sup>(9)</sup>

A meta-analysis of six controlled studies in East Africa showed no significant difference in the maternal and perinatal outcome for cesarean sections done by clinical officers and MDs.<sup>(10)</sup>

The WHO has launched the Emergency and Essential Surgical Care (EESC) programme to address the lack of adequate surgical capacity as a global public health issue. Sierra Leone is one of the 35 countries that have adopted the programme. It focuses on implementation of training materials, improving surgical infrastructure and implementing resources for monitoring and evaluating surgical, obstetrical and anesthetic capacity.<sup>(11)</sup>

## THE SURGICAL TRAINING PROGRAMME

In cooperation with the Ministry of Health and Sanitation (MoHS) the Norwegian NGO CapaCare has designed a surgical training programme (STP) to train MDs and NPCs in basic life saving surgery and obstetrics. The two-year training is followed by an oral and written exam and housemanships in the governmental hospitals in Freetown. The training is divided into a practical part and a theoretical part. The first six months of basic training are conducted at the central training centre, Masanga Hospital, before the students are assigned to rotations at two or three partner hospitals. Currently the programme is cooperating with twelve partner hospitals. The partner hospitals are selected on the basis of their surgical capacity, coverage of supervision and the availability of surgical resources.

The curriculum for the programme is based on the books Surgical Care at the District Hospital,<sup>(12)</sup> Anesthesia at the District Hospital<sup>(13)</sup> and the Life Saving Skills Manual.<sup>(14)</sup> The curriculum has been divided into seven different modules taught by different visiting consultant specialists. All procedures where students participate are recorded in a logbook. During the rotations the progress of the student is evaluated on a regular basis.

In July 2014, three and a half years after the start of the programme, 31 students were enrolled. Thirty of the students were trained as NPCs and one as an MD, 26 males and five females.

Out of the 31 students eleven passed the exam, sixteen are in the initial two years of training and five have dropped out of the programme (3 because of performance and 2 on request). From

the eleven that passed the final exam, eight are in housemanships, two have started working in district hospitals and the medical doctor is in surgical-specialist training in Ghana.

### SURGICAL PROCEDURES

All students together have participated in 14,902 surgical procedures in fifteen hospitals all over Sierra Leone, either as observer (20.7%), assistant (40.6%), surgeon under direct supervision (18.4%) or surgeon under indirect supervision (20.3%).

The majority (58.7%) of procedures were planned operations.

Of all procedures 8,756 were soft tissue surgeries, 5,540 obstetrics or gynecology, 603 orthopedic procedures and 3 neuro surgeries.

The three most performed procedures were inguinal hernia repair (26.1%); cesarean section (21.1%) and explorative laparotomy (4.5%) see table 1.

**Table 1** Top 10 surgical procedures (N=14,902)

Procedure	Percentage
Inguinal hernia repair	26.1%
Cesarean section	21.1%
Explorative laparotomy	4.5%
Appendectomy	3.3%
Scrotal hydrocele	3.3%
Tubal ligation	3.3%
Hysterectomy	3.0%
Dilation and curettage	2.9%
Incision and drainage	2.9%
Obstetrics and gynecology other	2.7%

The ultimate goal of surgical task-shifting is to increase capacity while maintaining high quality care in circumstances where the availability of human resources is limited. To sustain a high standard of care there should be a regulatory body that ensures proper certification, supervision and continuous learning.<sup>(15)</sup> At the moment this is lacking in Sierra Leone. The STP will only be successful if the MoHS or any other relevant political body is able to set up a control mechanism that certifies, supervises and regulates the surgical practice of NPCs.

One of CapaCare's main pillars is research and generation of new knowledge. Therefore a baseline study has been conducted at the beginning of 2013 to measure the surgical activity in the country in all health facilities before the graduation of the first STP students. After five years the same study could be conducted to assess if there is an increase in surgeries performed by non-specialists.

### EBOLA OUTBREAK

Since the first identified Sierra Leonean cases of Ebola in May 2014, the outbreak is ruining the health care of this country, as well as in neighbouring countries. The whole country is focused on fighting this threat and the normal clinical work is more or less put on hold. Patients are trying to avoid hospitals because of fear of infection and isolation. About 10% of the people who have died of Ebola infection have, up to now, been health workers. This has had a large negative impact on an already weak health care system, and also for the STP. Almost all the NGO partners have closed down their hospitals and most elective surgery is postponed.

Based on civil unrest and the fact that personal protective equipment was not sufficiently available we had to stop all the doctor training. One month later, one of our students passed away due to Ebola. Based on the fact that surgical exposure was limited and that there were, in general, limited protective resources, we have chosen to stop clinical rotations in order to avoid putting the students at further risk.

We hope that international intervention will soon lead to improvement in this situation and that we will be able to continue the training. The damage to the health system will be enormous and training of health care workers in basic life saving surgery will be essential for meeting the need of the Sierra Leonean population after the Ebola epidemic.



CONCLUSION

The Surgical Training Programme has been designed to increase the surgical capacity in Sierra Leone by training MDs and NPCs health officers in basic life saving surgery. This is done by using the concept of task-shifting in surgery widely used in East Africa. In the first 3,5 years eleven students passed the exam and the first two have started employment in district hospitals. The Ebola outbreak has a major negative impact on the Sierra Leonean health care system and the programme. Within the coming four years our aim is for all district hospitals in Sierra Leone to have at least two to three of the graduates of this programme available to take part in life saving surgery and obstetric care throughout the country.



ALEX VAN DUINEN  
SURGEON IN TRAINING, ST OLAV UNIVERSITY HOSPITAL TRONDHEIM, NORWAY  
BOARD MEMBER CAPACARE, NORWAY / ALEX.VANDUINEN@CAPACARE.ORG

BART WAALEWIJN  
NATIONAL COORDINATOR SURGICAL TRAINING PROGRAMME, CAPACARE, SIERRA LEONE  
TROPICAL DOCTOR, MASANGA HOSPITAL, SIERRA LEONE

BRYNJULF YSTGAARD  
GASTROINTESTINAL SURGEON, ST OLAV UNIVERSITY HOSPITAL TRONDHEIM, NORWAY  
BOARD MEMBER CAPACARE, NORWAY

HÅKON BOLKAN  
GENERAL SURGEON, ST OLAV UNIVERSITY HOSPITAL TRONDHEIM, NORWAY  
CHAIR CAPACARE, NORWAY. PHD STUDENT NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, TRONDHEIM, NORWAY

REFERENCES

1. Weiser TG, Regenbogen SE, Thompson KD, et al. An estimation of the global volume of surgery : a modelling strategy based on available data. *Lancet* 2008;6736:1-6. doi:10.1016/S0140-6736(08)60878-8.
2. Kingham TP, Kamara TB, Cherian MN, et al. Quantifying Surgical Capacity in Sierra Leone. *Arch Surg* 2009;144:122-7. <http://www.ncbi.nlm.nih.gov/pubmed/19221322>
3. Groen RS, Samai M, Stewart K, et al. Untreated surgical conditions in Sierra Leone : a cluster randomised , cross-sectional , countrywide survey. *Lancet* 2012;380:1082-7. doi:10.1016/S0140-6736(12)61081-2.
4. Maxmen A. Sierra Leone's free health-care initiative: work in progress. *Lancet* 2013;381:191-2. doi:10.1016/S0140-6736(13)60074-4.
5. University of Sierra Leone. Students Graduating from Medical Training. 2013.
6. WHO. Treat Train Retrain; Task Shifting: rational redistribution of tasks among health workforce teams - Global Recommendations and Guidelines. Geneva, Switzerland: 2008.
7. Sesay IM, Twea S, Kalanda B, et al. Evaluation Report: UNFPA Sierra Leone Fourth Country Programme (2008-2010). Freetown, Sierra Leone: 2009.
8. WHO. Optimizing health worker roles to improve access to key maternal and newborn health interventions through task shifting. Geneva, Switzerland: 2012.
9. Pereira C, Cumbi A, Malane R, et al. Meeting the need for emergency obstetric care in Mozambique: Work performance and histories of medical doctors and assistant medical officers trained for surgery.pdf. *BJOG* 2007;11330-3.
10. Wilson A, Lissauer D, Thangaratnam S, et al. A comparison of clinical officers with medical doctors on outcomes of caesarean section in the developing world: meta-analysis of controlled studies. *BMJ* 2011;342:d2600-d2600. doi:10.1136/bmj.d2600.
11. Abdullah F, Troedsson H, Cherian M. The World Health Organization program for emergency surgical, obstetric, and anesthetic care: from Mongolia to the future. *Arch Surg* 2011;146:620-3. <http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L361317369>
12. World Health Organization. Surgical Care at the District Hospital. WHO Library Cataloguing-in-Publication Data 2003.
13. Dobson MB, Atherton D. Anaesthesia at the District Hospital. World Health Organization 2000.
14. Broek N van den. Life Saving Skills Manual: Essential Obstetric and Newborn Care. Royal College of Obstetricians and Gynaecologists 2007.
15. Aliu O, Pannucci CJ, Chung KC. Qualitative Analysis of the Perspectives of Volunteer Reconstructive Surgeons on Participation in Task-Shifting Programs for Surgical-Capacity Building in Low-Resource Countries. *World J Surg* 2013;37:481-7. doi:10.1007/s00268-012-1885-5.



## A toxic mix of white and professional arrogance

*A personal commentary*

Recently, I attended the NVTG/Uniting Streams symposium on “Engaging Communities in Sickness and Health”. It was a nice day, full of interesting meetings and discussions and, at least for me, above all, meeting people again. Diehards like myself, getting older with extensive tropical careers long behind them, younger ones full of enthusiasm and expectations for their future and the active ones, now in the middle of their careers. All nice enough, yet I could not help gradually feeling an increasing sense of frustration.

Again I had experienced what I see as the same toxic mix of white and professional arrogance that, in my opinion, has bedevilled both the Primary Health Care and Community care concepts from their very inception. The same frustration that I felt after a symposium organized by the Health and Development (GEO) group about 15 years (!) ago with the title “What have we learned in 25 years of Primary Health Care ?” Then, as now, in my opinion the answer should be that in some essential aspects we have learned hardly anything at all!

Otherwise, how is it possible, that, in a symposium with in its title ‘engaging communities’, there is not the slightest attention for African traditional structures and cultures, including traditional healers, in nearly all the presentations and discussions? How can one presenter tell me “We all know the great influence of the traditional culture on the community” while not even mentioning it in a presentation, which was all about Community Health Workers (CHW’s) and the problems related to their functioning? That, when discussing the difficulties with regards to a payment structure for CHW’s, it is not mentioned, that very many villagers go first to a traditional healer whom they pay and only come to ‘modern’ facilities in case of failure? Why do we still completely ignore the emotions and sentiments of African villagers, which confirms to them, what they are convinced about anyway, that we do not

take them and their emotions seriously. Why are we not able to realize, that, if we want to make progress in health, it is not sufficient to appeal to ratio. That we have to appeal to emotions in our approaches! Africans feel that no one outside Africa is taking them seriously, and who can blame them?

Just one example: Planning of malaria projects. I have argued that when planning, you include and start with making an inventory of all those treating people with fever (doctors, pharmacies, health workers, traditional healers, street vendors) in the area where you plan advocacy activities. And then use the inventory to judge whom of those you can involve in your advocacy programme? Otherwise, If you fail to do that, what do you expect Africans to do when, ill with fever, they go to traditional healer and hear very different ideas from him or her? Africans, in my opinion, when healthy are very apt in storing our/your ideas in the space in their heads reserved for them, and follow those of a traditional healer when ill! (often a mother with a small child with fever will actually have no other option open to her).

Engaging and Involving efforts of communities should start with what is important in the lives of the members. That should be a ‘conditio sine qua non!..... In Holland as well as in Africa!

It is my experience that I always get some support when bringing up these points and never any serious objections. But also, that this issue simply continues to be ignored. To my knowledge it has never come to a serious discussion up till now. Can we not start one within the NVTG?

May I appeal to you, NVTG members, to bring it up if you agree or disagree with me and tell me (us) why?



STEVEN SMITS / STEVENPSMITS@GMAIL.COM



# Driving the Best Science to Meet Global Health Challenges

The 9<sup>th</sup> European Congress on Tropical Medicine and International Health brings together some 2000 of the most distinguished scientists and experts in the field of tropical medicine and international health. It is the premier European congress in this field.

Participants will address new solutions for the most neglected populations on the planet and especially how to apply the best science for global health challenges.

Throughout plenaries, seminars and six to eight parallel scientific sessions, the conference will reflect on global health challenges, neglected diseases, the millennium development goals and what comes after. The event will also offer a platform from which to reinforce and further promote public private-partnerships and policy dialogue to add value to and expedite the process from innovation to application.

The congress will provide a forum for scientists, politicians, NGOs, and public and private health experts to exchange new ideas and to discuss solutions to the global health challenges of today and tomorrow.

## SAVE THE DATE

ECTMIH15, Basel 6 –10 September 2015  
 9<sup>th</sup> European Congress on Tropical Medicine and International Health  
 6–10 September 2015 • Basel, Switzerland

## CONTACT

Conference organizer:  
 ectmih@congrex-switzerland.com  
 Swiss Tropical and Public Health Institute  
 ECTMIH Basel 2015  
 P.O. Box, CH – 4002 Basel

[www.ectmihbasel2015.ch](http://www.ectmihbasel2015.ch)

**9<sup>th</sup> European Congress on Tropical Medicine and International Health**

Swiss TPH  
 Swiss Tropical and Public Health Institute  
 Schweizerisches Tropen- und Public Health-Institut  
 Institut Tropical et de Santé Publique Suisse  
 Associated Institute of the University of Basel

**9<sup>th</sup> European Congress on Tropical Medicine and International Health**

6–10 September 2015, Basel, Switzerland  
**Driving the Best Science to Meet Global Health Challenges**

[www.ectmihbasel2015.ch](http://www.ectmihbasel2015.ch)

SG 7 P  
 SSMTP  
 SSTMP



# MYCETOMA



Figure 1



Figure 2



Figure 3



Figure 4

## SETTING

The LAMB hospital (Lutherian Aid to Medicine Bangladesh) is located in the Dinajpur District in the Northwestern part of Bangladesh, approximately 320 kilometers from Dhaka. It is a general hospital with a capacity of 150 beds and a large outpatient clinic run by 200 staff members, mainly Bangla-deshi with a small number of expatriates. Annually, healthcare is provided to 10,000 inpatients and 6,000 outpatients. The population of Bangladesh is highly dense and fast growing and natural disasters occur frequently.

## CASE

A 30-year-old male complained of a painful and slow growing swelling of his left foot and difficulty in walking. The condition started two years ago when he had a splinter removed. Upon examination at the medial side of the left foot, a swelling of 60 millimeter in diameter was seen with multiple sinuses, continuing in the deeper tissues, which was non-mobile and painful (Figure 1). The patient mentioned some discharge from the lesion. A biopsy was performed in another hospital and histopathology showed acute and chronic inflammation without signs of granuloma, malignancy or fungal infection. The attending surgeon considered an amputation but first consulted the Consult Online surgeons for their expertise on this matter.



### SPECIALIST ADVICE

Within one day two surgeons gave their opinion and advice on this case. Both suspected a Mycetoma, until recently also known as Madura foot, due to the history and the presence of sinuses. They suggested that the biopsy may have been too superficial to lead to a conclusive diagnosis.

An extensive wound debridement and simultaneous deep tissue biopsy was advised. They also recommended taking X-rays of the affected body part to look for additional bone infection.

### TREATMENT AND FOLLOW UP

A plain X-ray of the left foot showed no signs of bone involvement. Consistent with the given advice a wound debridement and a deep tissue biopsy were carried out. Figure 2 shows the post-operative result. The patient was also treated with griseovulfine, a fungistatic antibiotic. Itraconazole or ketoconazole would have been the drug of first choice, but it would be prohibitively expensive to use for a long period of time.

Eighteen days after initial surgery the wound appeared infected. A culture revealed a *Staphylococcus aureus* infection. Cloxacillin was added to the treatment regime. In the meantime the result of the deep tissue biopsy indicated the presence of colonies of *Actinomyces* species within acute inflammatory cells. This confirmed the suspected diagnosis. Ceftriaxone and later cotrimoxazole were added to the treatment regimen.

After 2,5 months of treatment the wound was covered with granulation tissue and showed no signs of infection (Figure 3). During a second operation a split skin graft was done and after 1 month the wound was almost entirely covered with normal skin, as showed in Figure 4. The patient is now able to walk normally which is only slightly painful.

### MYCETOMA

Mycetoma is a common health problem in tropical regions and recently listed by the WHO as neglected tropical disease. It was initially named Madura foot, after

the Madurai region in India where it was first described in 1842.

It is a chronic infection of subcutaneous tissue characterized by a painless subcutaneous mass, sinus formation and purulent discharge containing grains. Pain is not a frequent feature unless bone is involved or the wound is secondarily infected.

The feet are mainly affected, but lesions also occur at the hands and to a lesser extent elsewhere. The origin of the infection is unknown but the initial lesion is thought to start with minor trauma, for example a thorn prick, splinter or insect bite, resulting over time in tumor-like swelling of the limbs.

Men seem more often affected, but most reports are from hospital-based studies and may therefore be biased.

Mycetoma can be caused by either fungi (eumycetoma) or filamented bacteria (actinomycetoma). Often it is difficult to distinguish between these on clinical grounds only. The color and the shape of the grains may help, but misclassifications occur. Cytology and culture are needed for confirmation of the causative agent; PCR-based diagnosis would be conclusive. This is of great clinical importance since this affects treatment. The initial treatment consists of prolonged systemic anti-fungal (for eumycetoma) or antimicrobial therapy (for actinomycetoma) for 6 to 12 months. In extensive cases which cannot be controlled by medication only, surgery may be necessary. In many cases the treatment course is challenging due to the expenses, loss of follow up and recurrence rates. Unfortunately amputation of an affected limb is in some cases necessary [1,2,3].

### DISCUSSION

The main differential diagnoses include early stage Buruli ulcer, cutaneous tuberculosis, cutaneous leishmaniasis, other deep fungal infections and malignancies of the skin and bone. The triad of clinical features that include swelling, the presence of sinuses and appearance of grains produce the typical and distinguishing features of mycetoma.

Since both fungi and actinomycetes may be causative agents, it is important to make this distinction to start the correct treatment. In many tropical settings it is difficult to support the diagnosis with laboratory results since cytology, culture and PCR are not widely available. In the absence of such testing, the only distinguishing feature is the color of the grains, but misclassification may occur.

The duration is often an obstacle in treatment of mycetoma. Depending on clinical progress this often takes 6 to 12 months and the cost is therefore high. Many patients drop out and are lost to follow up. A study from Sudan reported that approximately 50% of the patients did not complete their treatment course [4]. Another issue is the high incidence (65%) of secondary infection by bacteria, most often by *Staphylococcus aureus* [5]. This superinfection accounts for another challenge in treating mycetomas.

During the process of preparing this article, we received valuable input from a colleague in Sudan with ample experience in diagnosing and treating mycetoma. His comments can be found in box 1.

He argued that all treatment options should be exhausted before resorting to surgery, given the fact that actinomycetoma often responds well to medication. However, given the long duration of the treatment, this option may pose severe challenges regarding adherence and drug availability, especially in low resource settings. Overall, we may conclude there are two main difficulties in dealing with mycetoma: first to establish a reliable diagnosis which distinguishes between fungal and bacterial infection and second, to decide if and when surgery is necessary. In conclusion, this case study offers an interesting and challenging discussion at the intersection of surgery and infectious diseases.



### AFFILIATIONS

DAPHNE VOOREND, MD, TROPICAL DOCTOR IN TRAINING, CONSULT ONLINE, CONSULTONLINE@TROPENOPLEIDING.NL

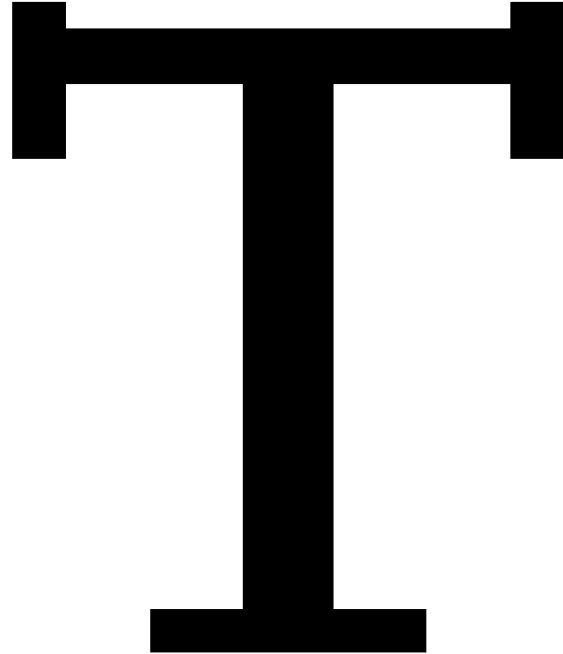
ANTJE OOSTERKAMP, MD, ONCOLOGICAL SURGEON, LAMB HOSPITAL, BANGLADESH

## REFERENCES

1. Zijlstra EE. Mycetoma. *Medicus Tropicus Bulletin* 2013;01: 12-13.
2. Van de Sande WWJ, Mahgoub ES, Fahal AH, Goodfellow M, Welsh O, Zijlstra EE. The myce-toma knowledge gap: identification of research priorities. *PLoS Negl Trop Dis.* 2014 Mar 27;8(3):e2667.
3. Van de Sande WWJ, Fahal AH, Goodfellow M, Mahgoub ES, Welsh O, Zijlstra EE. Merits and Pitfalls of Currently Used Diagnostic Tools in Mycetoma. *PLoS Negl Trop Dis.* 2014 8(7): e2918.
4. Zein HA, Fahal AH, Mahgoub ES, El Hassan TA, Abdel-Rahman ME. Predictors of cure, ampu-tation and follow-up dropout among patients with mycetoma seen at the Mycetoma Re-search Centre, University of Khartoum, Sudan. *Trans R Soc Trop Med Hyg.* 2012 106: 639–644.
5. Ahmed AO, Abugroun ES. Unexpected high prevalence of secondary bacterial infection in pa-tients with myce-toma. *J Clin Microbiol* 1998 36: 850–851.

## EDITOR'S COMMENT

Prof Ahmed Fahal, Mycetoma Research Center, Khartoum, was asked to re-view this case.



This is an interesting case as pain and difficulty in walking are not common presenting symptoms of mycetoma. It is not clear how deep the surgical biopsy was. The surgical biopsy should always be deep to contain an adequate quantity of grains and should be done in under general, spinal or re-gional anaesthe-sia. Excisional biopsy (wide local excision) is preferred. Local anaesthesia is not rec-ommended as to avoid a superficial biopsy.

The indication for amputation recommended by the attending surgeon is not clear. It is difficult to consider amputation in such patients without a good indication; this would include massive disease with bone affection not responding to pro-longed treatment, severe sepsis, massive disability, de-formity and the patient's request. It was wise to take another deep biopsy and to request X-ray of the affected part to establish the diagnosis.

The patient was started on griseovulfine (an antifungal agent); without histopathological or culture evidence of eumycetoma such treatment can be harmful. Also note that ketoconazole, another anti-fungal agent, was banned by FDA due to its hepatic and adrenal toxicity. There was no need to this radical surgery and the skin graft cover as actinomycetoma responds well to medical (antibacterial) treatment that should include co-trimoxazole combined with an aminoglycoside in severe cases. In this case, the outcome at 1 month follow-up is satisfactory; prolonged follow-up for at least 12 months is advised to detect possible recurrence.



ED ZIJLSTRA, ROTTERDAM CENTRE FOR TROPICAL MEDICINE

# NVTG

Membership of the Netherlands Society for Tropical Medicine and International Health (NVTG) runs from January 1<sup>st</sup> to December 31<sup>st</sup> and may commence at any time. Membership will be renewed automatically unless cancelled in writing before December 31<sup>st</sup>. Membership includes MT and International Health Alerts. An optional subscription to TM&IH carries an additional cost.

Non NVTG members can subscribe to MT through a student membership of the Society for € 23 per year by sending the registration form through our website [www.nvtg.org/lidwoorden](http://www.nvtg.org/lidwoorden) or by sending name and postal address by e-mail to [info@nvtg.org](mailto:info@nvtg.org) or [MTredactie@nvtg.org](mailto:MTredactie@nvtg.org).

Contributions and announcements should be submitted to the editorial office by e-mail: [info@nvtg.org](mailto:info@nvtg.org) or [MTredactie@nvtg.org](mailto:MTredactie@nvtg.org). Closing date for N° 01 / March 2015: 26-01-2015.

Disclaimer: all views expressed in this journal are of the authors only and are not necessarily shared by the editors of MT. Letters and articles may be edited for purposes of (clarity and) space.

## Netherlands Society for Tropical Medicine and International Health

President: A.A.L.J. (Ankie) van den Broek

Secretary: M. Lagro

Secretariat: J.C. Hoppenbrouwer

P.O. Box 82

3738 ZM Maartensdijk

The Netherlands

+31(0)6-53515773

[info@nvtg.org](mailto:info@nvtg.org)

[www.nvtg.org](http://www.nvtg.org)

Werkgroep COTG (Concilium Opleiding Tropische Gezondheidszorg) and CIGT (Concilium Internationale Gezondheidszorg en Tropengeneeskunde)

Sluiskade Noordzijde 96

7602 HW Almelo

+31(0)546-451765

[cotg@nvtg.org](mailto:cotg@nvtg.org) / [cigt@nvtg.org](mailto:cigt@nvtg.org)