Global health and orthopaedic surgery—A call for international morbidity and mortality conferences

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ABSTRACT

INTRODUCTION: There is a large discrepancy between supply and demand of surgical services in developing countries. This inequality holds true in orthopaedic surgery and the delivery of musculoskeletal care. Intertwined amongst the decision to perform surgical procedures in the developing world are the ethics of doing so – just because one is capable of performing a procedure, should it be done?

PRESENTATION OF CASE: A 31 year-old female with end-stage joint destruction underwent a left total hip replacement by a foreign orthopaedic team in Tanzania. She had a favorable outcome for 8 months, but is now diagnosed with tuberculosis and a deep space infection in her prosthetic left hip – an unsolvable problem in the developing world.

DISCUSSION: This case demonstrates the ethical challenges that can be created from performing surgical procedures in the developing world without concomitant access to appropriate patient follow-up or resources for treating post-operative complications. While the current system is inadequate to manage the burden of disease, these inadequacies may be exacerbated at times by post-operative complications resulting from well-intentioned surgical missions.

CONCLUSION: This case illustrates many difficulties in caring for individuals in the developing world, raising several questions: (1) How can complications be prevented in the future? (2) What are possible ways of managing complications with resources at hand once it occurs? (3) What resources are needed to minimize patient? Ideally an international forum can help provide descriptions of issues and problems that are encountered so as to increase awareness and identify potential solutions.

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1. Introduction

There is a large discrepancy between the supply and demand of surgical services in the developing world, especially for nations in Sub-Saharan Africa. In 2008, of the estimated 235 million surgical procedures performed annually, only 3.5% was performed in developing countries [1]. This inequality also holds true in the field of orthopaedic surgery and the delivery of musculoskeletal care. Over the past decade, many countries in Africa have experienced economic growth, which has been associated with a marked increase in motor vehicle traffic [2]. This has led to an increase in injuries from road traffic accidents (RTA) secondary to a lack of concomitant investment in infrastructure, implementation of traffic and safety laws, and noncompliance with the use of seat-belts and helmets.

There has been longstanding and growing interest from the developed world in assisting the developing world, including providing surgical services. Involvement in the early 19th century began with a religious focus through “mission trips” that commonly had evangelical motives. The mission trip concept has evolved beyond religious goals to include trips geared towards providing medical and surgical care in the developing world during periodic short trips by medical teams. The typical goals of such trips are to treat patients in need, decrease the local burden of disease through direct patient care and to build local capacity through education and training. In 2012, there were approximately 6000 such medical missions with approximately $250 million raised for funding [3].

In recent years, a growing number of teams of well-intentioned international orthopaedic surgeons have volunteered their time and expertise on trips to the developing world. These medical missions are designed to perform a high volume of surgical procedures over a short period of time. During these trips, a large amount of
material resources are transferred to the developing world in order to create a functional operating room facility in the target country.

Such surgical missions are assumed to be effective in achieving their goals, however, this approach to care raises several questions related to the medical, economic, and social state of the target country including: (1) What happens to patients that develop a post-operative complication after the surgical team returns to their native country? (2) Are there facilities available for patients to receive treatment for the complication? (3) Are the intellectual and material resources at the facility adequate to provide the appropriate treatment for complications? (4) Is the infrastructure suitable for patients to travel from their homes to the facility? (5) Assuming that a treatment facility and resources are available, is the treatment affordable to the patient? (6) Is the treatment culturally acceptable to the patient?

Intertwined amongst the decision to perform surgical procedures in the developing world are the ethics of doing so—just because one is capable of performing a procedure, should it be done? Is a procedure such as a total hip replacement, which is appropriate in a developed country, also appropriate in a country with fewer resources for postoperative care? Systems limitations locally within the target country may result in patients being left in worse positions than they were prior to treatment. We present a case performed in Tanzania that resulted in the development of an untreatable post-operative complication. This testimony highlights the urgent need for a different approach to providing surgical services in the developing world, but also emphasizes the need for open forums for discussion of international morbidity and mortality cases.

2. Presentation of case

SM is a woman who at age 31 resided in a small rural village on the outskirts of Nairobi, Kenya. She lived with her parents and her two younger brothers in a 20 ft × 20 ft dwelling. At the age of 5, she was afflicted with a condition that affected several of her major joints. She was diagnosed with rheumatoid arthritis. Her condition was not treated medically due to a lack of family resources as well as the limited availability of local treatment options. She was fortunate to be well educated and has completed high school after which she obtained a clerical position at a printing and press and was able to work daily, although with severe pain and deformities.

As she grew, she had noticed worsening left hip pain. The pain was located in the left groin and was present at rest, but exacerbated with motion. By the age of 29, the left hip was auto-fused to her pelvis resulting in no range of motion and a significant residual deformity. By this point, most of the symptoms were consistent with low back pain and degenerative disk disease due to increased loads experienced across the lumbosacral spine secondary to the auto-fusion of the left hip.

In July 2012, at 33 years of age, the patient sought treatment from a rheumatologist in Nairobi and was told that she would need a total hip replacement (THR). However, a THR in Nairobi would cost $7000, which was cost-prohibitive. Although discouraged, the patient tenaciously sought alternative routes for getting the appropriate treatment. By November 2012, due to the severe soft-tissue contracture (e.g., severe adduction contracture) surrounding the left hip, she was unable to urinate comfortably and was unable to have children because vaginal delivery would not be possible.

In November 2012, a rheumatology conference was held in Nairobi. A rheumatology colleague from one of the authors (NPS) home University in the United States attended the conference and met the patient. Intrigued by her story, she contacted the author upon her return and asked him to engage in her care. In February 2013, the author was scheduled to travel to a hospital in Arusha, Tanzania for a short teaching trip, which is approximately 250 miles from the patient’s home. It was agreed upon to meet the patient in Arusha, along with new radiographs of the pelvis and left hip as well baseline labs including a sedimentation rate (ESR) and C-reactive protein (CRP).

In February 2013, the patient traveled by Tuk–Tuk (an open air carriage so named because of the sound of the motor) for 9 h to meet the surgeon and the orthopaedic team at the Arusha Lutheran Medical Center in Tanzania. She presented with the requested radiographs (Fig. 1a and b) and the requested laboratory work. The patient’s ESR and CRP were 33 (range 0–20) and 3.2 (range 0–6), respectively. The mildly elevated ESR (normal CRP), although not specific for any given inflammatory process, was consistent with a diagnosis of rheumatoid arthritis, but inconsistent with an infectious process. Based on her normal CRP, a hip aspiration was not performed. It was evident that her deformity was severe and debilitating. The patient stated that the problems she had with her hip permeated her entire life. Her inability to bear children, in turn made her undesirable for marriage.

### Fig. 1. Pre-operative (a) anteroposterior (AP) pelvis and (b) lateral X-ray projections of the left hip.
On physical examination, the left hip was free from previous incisions. There was a chronic rheumatoid nodule present at the superolateral aspect of her left hip projecting through the skin. There was no gross evidence of infection. The hip was in a fixed position of 40° of flexion, 20° of adduction, and 10° of internal rotation. The left lower extremity was 7 cm shorter than the right. Motor and sensory functions were grossly intact throughout the left lower extremity.

This case presented a challenging ethical problem – the patient had a problem that could be addressed with a technically challenging THR, but what if there was a complication post-operatively? Did the benefit of changing this woman’s status in her village outweigh the risk associated with the surgical procedure? The local hospital offered a prosthesis that the surgical team had left behind from a surgical mission the previous year. Since there was no surgical or implantation fee for the patient, her only financial responsibility would be the post-operative hospital costs amounting to $1000 US, which was feasible for her due to donations by relatives and friends. The decision was made to proceed with the surgical procedure after a detailed informed consent process. The patient was made aware of and demonstrated understanding of the alternatives, risks and benefits of a THR. A pre-operative consent form was signed by the patient and witnessed by the surgeon (NPS).

The morning of surgery, the patient received pre-operative antibiotics and underwent spinal anesthesia. The left THR was performed without any intra-operative complications. There was no gross evidence of intraarticular infection at the time of surgery. Due to the unique anatomic considerations of the patient – a small pelvis with very poor bone quality secondary to disuse osteopenia – a combination of components from different orthopaedic implant manufacturers were mixed and matched in order to achieve a stable final construct (Fig. 2a and b). Her host bone was extremely osteoporotic and was unable to accept the only cementless acetabular device that was available for implantation given her size; having no other options, this cup was cemented in place.

The patient tolerated the procedure well and was brought back to the recovery room in stable condition. Her leg length had been restored, and soft-tissue contractures had been adequately addressed (Fig. 3a and b). The patient’s limb was neurovascullarly intact.

The post-operative course in the hospital was prolonged. The patient was weight bearing as tolerated with minimal discomfort. However, due to scant persistent serosanguinous wound drainage for several days, she was placed on intravenous antibiotic treatment. While this was associated with diminution of the drainage, it also added to her total cost burden. The patient’s wound eventually healed, and she was discharged to home after a 3-week hospital stay.

Once back at home in Nairobi, Kenya, the patient completed an extensive self-directed physical therapy program outlined by the operative surgeon, since therapy services were not readily available due to high cost. The patient maintained contact with the surgeon via email with periodic updates on a monthly basis. She had been doing extremely well and was very happy with her surgical outcome.

In October 2013, approximately 7 months following the index surgical procedure, the patient sent an email stating that she had new onset left hip pain. The pain began insidiously, and had become constant, both at rest as well as with activity. An X-ray of her hip that was reviewed by the operative surgeon (NPS) demonstrated no interval change in component position and no peri-prosthetic fracture (Fig. 4a and b). It was recommended that the patient obtain a new ESR and CRP to rule-out deep space peri-prosthetic infection. A set of inflammatory markers was obtained (ESR 136 and CRP 12, respectively) which was suggestive of a deep space peri-prosthetic infection. Accordingly, she was advised to seek evaluation by an orthopaedic surgeon for a hip aspiration, as obtaining synovial fluid from her left hip would be the only way to definitively diagnose the presence of a deep space infection around her left THR, which is potentially very severe.

Effective treatment of a deep space peri-prosthetic infection typically requires using several expensive resources (e.g., 6 weeks of intravenous antibiotic therapy through a peripherally inserted central catheter), a multi-disciplinary team approach (i.e., orthopaedic surgery with expertise in revision surgery, infectious disease, and a pathologist (needed for evaluation for intra-operative specimen obtained for final microbiology), and one or more additional operations. In Kenya, this treatment would cost several thousand US dollars, assuming that the full complement of intellectual and material resources are available at a given hospital facility. Prior to surgical intervention, the patient was suffering from significant pain, deformity, limitations with activities of daily living, as well as the social stigma associated with her condition.
However, she now is not only in pain, but also likely has a deep-space infection, with an organism with unknown virulence, which can result in a general deterioration of her health, systemic sepsis, and possibly death without appropriate timely treatment.

3. Discussion

This case demonstrates the ethical challenges that can be created from performing surgical procedures in the developing world without concomitant access to appropriate patient follow-up or resources for treating post-operative complications. While the current system is inadequate to manage the burden of disease, these inadequacies may be exacerbated at times by post-operative complications resulting from well-intentioned surgical missions. Consequently, there is need for a new paradigm which provides a more sustainable solution with increased local capacity to treat complications associated with surgical procedures. Arguably, this should be considered prior to medical missions and discussed with local personnel and communities as trips are being planned. In addition, until an adequate infrastructure is developed, the informed consent process for surgery in this setting should include a frank discussion about not only potential surgical complications, but also the possibility that they may not be able to be managed appropriately given constrained local resources.

This care also raises the very compelling argument, that in retrospect, a total hip replacement may not have been the best choice for this patient. Although her preoperative labs were not suggestive of a septic process, the possibility exists that a total hip was done in the setting of an indolent tuberculous infection. Moreover, other, more simple surgical procedures, more in-line with the current local standards of care may have been more appropriate for this patient. One could argue, that in this case a simple left femoral subtrochanteric osteotomy with tenotomies and a period of plaster of Paris immobilization, could have allowed for the correction of her deformity, improvement of her status, while minimizing the risks that are inherent in a total hip arthroplasty.

Surgeons across the globe strive to better themselves and optimize patient care. In an ideal world, operations would occur flawlessly without fear of complication. Unfortunately, complications are very real and a legitimate concern of every surgery performed. When a complication does occur, it is paramount to critically evaluate the problem, rectify it, and to attempt to prevent future events from occurring.

Morbidity and mortality conferences (MMCs) are a hallmark of critical peer review. They have been used since the early 1900s as a means to learn from complications and have been a cornerstone in medical education. They were first implemented in surgical departments and later spread to internal medicine and other specialties. As the focus on quality assurance has grown, many institutions have implemented MMCs as a tool to promote healthcare quality and safety. The core purpose of MMCs should be to call attention to the shortcomings in an organization or patient care that potentially contributed to a complication or the death of a patient and to implement actions aimed at avoiding the reoccurrence of such events.

As more resources and opportunities arise to provide medical assistance in the developing world, it is critical to evaluate the impact this is having. For example, there have been calls to ensure that long-term outcomes from mission-based surgeries are mea-
sured to help ensure that there are indeed net benefits to patients and communities [8]. Nonetheless, even with the best of intentions, complications can and will happen. In the developed world, MMCs are typically held in a grand rounds type forum and allow discussions amongst people involved directly in the case and those who are third party observers. In the international forum, our ability to convene as a group is difficult, but this should not preclude our ability to conduct MMCs. In the electronic age, a written forum such as this will allow an open forum to discuss our complications and to develop solutions and potentially a network of qualified individuals to assist in managing these complex issues. Moreover, a collection of these cases will likely be a rich source of data to drive policy improvement as well as education and training. In addition, consideration should be given to developing other means to promote productive conversations regarding such cases. This might include a secure wiki or similar web-based platform that does not require broad bandwidth in which surgeons and other stakeholders, both locally and internationally, could comment on cases thereby creating an opportunity to elicit important perspectives.

4. Conclusion

The presented case illustrates many of the difficulties in caring for individuals in the developing world, raising several important questions: (1) How can such complications be prevented in the future? (2) What are the possible ways of managing a complication with the resources at hand once it occurs? (3) What resources are needed to minimize risk to patients? While, the answers to these questions may not be evident at this point in time, ideally a forum such as a written MMC can help provide rich descriptions of the issues and problems that are encountered so as to increase awareness of them so that appropriate solutions can be identified. In this way, those engaged in well-intentioned medical missions can meet their obligations to help and minimize potential harms in a world that is characterized by marked disparities of resources.

Conflict of interest

There are no conflicts of interest regarding the submission of this manuscript. Patient consent was obtained and can be provided.

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Neil Sheth – Writing.
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Jared Foran – Writing and Editing.
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Consent

All edits/alteration are assured that not to distort scientific meaning of the information presented.

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