SURGICAL TOURNIQUETS
THE CONTAMINATION RISK OF REUSABLE CUFFS
The History of Tourniquets

Since the Roman times, surgeons have been using constricting devices to prevent blood loss during amputation. A simple rag tied above the incision site was often the chosen apparatus. For 1500 years not much changed until the morel type tourniquet was introduced during the mid-16th century. This involved the use of a stick to twist the constricting device in order to tighten it around the limb.

In Paris 1718, Jean Louis Petit presented his invention of the screw tourniquet to the Academie Royal des Sciences. Petit was the first person to use the term ‘tourniquet’ which derived from the French verb tourner (to turn). Petit’s invention allowed the operator to adjust the pressure around the limb with just a minor turn of a screw.

In the early 19th century a number of surgeons were described as using bandaging methods to exsanguinate a limb before placing a tourniquet. Esmarch was one of these surgeons and the original ‘Esmarch’ bandage was a rubber tube around 1 cm in width, wound tightly around the limb. Up until the mid-19th century tourniquets were still only in use for amputating limbs. It wasn’t until the 1860’s that Joseph Lister started to promote the use bloodless fields for other procedures.

In 1904 the rubber tourniquet was abandoned by Harvey Cushing due to risk of nerve palsy and difficulty in application and removal. Inspiration for the original pneumatic tourniquet came from the Riva Rocci blood pressure device. Modern day tourniquet cuffs and machines offer us the ability to set pressures and alarms, ensuring adequate compression and improve patient safety.

The Contamination Risk of Reusable Cuffs

Bloodless Field Surgery

Tourniquets are commonly used in orthopaedic procedures to create a ‘bloodless field’. Bloodless field surgery utilises tourniquets to occlude blood flow to extremities. After use the tourniquet cuff should be cleaned and stored until the next surgical procedure. However, tourniquets in theatre are rarely cleaned according to the manufacturer’s guidelines and studies have shown tourniquets could be a source of microbial contamination during surgery.

During surgery preparation the tourniquet cuff will be placed at both distal and proximal edges to the surgical site (fig.1). The site will then be washed to sterilise the area. Due to the cuff being placed prior to the sterile wash, the area beneath the cuff will be unsterilized. As such, a non-sterile cuff is applied close to the surgical site leading to a potential risk of contamination.

A post-surgery infection can cause the patient great discomfort and can increase costs for health care. For example, if a joint becomes infected after joint replacement surgery there are different treatments available dependant on the severity of the infection. If the skin and soft tissue around the joint becomes infected the doctor may prescribe intravenous (IV) or oral antibiotics. However, if there is a deep infection and it is caught late it will require further surgery. The initial implant will need to be removed and the joint washed out. An antibiotic spacer will then be placed providing the patient comfort and mobility while the infection is treated. Once the infection has been cured the patient will then be a candidate for a new implant.

In a study into orthopaedic tourniquets, all sampled tourniquets were contaminated with colony counts ranging from 9 to over 385. Coagulase-negative Staphylococcus spp. were present on every tourniquet sampled. Two tourniquets grew methicillin-resistant Staphylococcus aureus (MRSA), one Pseudomonas spp., one Staphylococcus aureus and one mould. Coagulase-negative Staphylococcus spp. were the most common organisms (96%) followed by Bacillus spp. (1.6%). Some plates were very contaminated and an exact count of the plate was not possible; the counts were labelled as more than 100 or more than 200.

The use of single-use tourniquet cuffs can help decrease the chance of infection during orthopaedic surgery.

The Time-Consuming Cleaning Process of Reusable Tourniquet Cuffs

A reusable tourniquet cuff including all tubing and connectors should be properly cleaned and inspected after each surgical procedure. A tourniquet cuff should be cleaned in lukewarm water using an approved disinfectant. The cuff should be thoroughly rinsed to remove all cleaning solution. Cleaning solutions can cause skin irritation, allergic reactions and decrease the life of the cuff and bladder if not rinsed properly. It may also be necessary to use a soft brush to remove encrusted material.

All tubing should be cleaned, rinsed and dried after use and before storage, taking care to
increased resistance it becomes harder to cure the faster this resistance increases. With this resistance. The more we use antibiotics, causing the bacteria in circulation to build excessive and incorrect use of antibiotics is helping cure bacterial infections (fig.2). However, antibiotics are commonly used in most cases to help cure bacterial infections (fig.2). However, excessive and incorrect use of antibiotics is causing the bacteria in circulation to build up resistance. The more we use antibiotics, the faster this resistance increases. With this increased resistance it becomes harder to cure infections and can have severe consequences for patients and high costs for health care. 5

Infection Prevention
Surgical procedures interfere with the normal skin barrier and can expose patients to infections. Prevention of SSIs is a primary concern for surgeons. Any surgical practice should have specific policies and procedures in place to prevent this risk of infection to patients. These policies and procedures should cover: skin disinfection, hand-washing practices, preparation of patient’s skin (hair removal etc.) use of prophylactic antibiotics, preparation of the operative site, management of the postoperative site if drains, dressings, or both are in place, behaviour and practice of the operating team (use of gown, mask, gloves etc.), operating team training and sterilization and disinfection of instrumentation. (fig. 3) 6

Operating theatres are equipped with specialized air ventilation systems in order to lower air contamination. The air in an operating theatre will be changed 15-25 times per hour in order to reduce bacterial content, and therefore the risk of infection. Laminar flow ventilation is a more efficient air ventilation system comprising of a continuous flow of highly filtered ultraclean air of less than 10 cfu/m3 of bacteria. In theatres where laminar flow ventilation is used, the air may be changed more than 300 times per hour.

Studies have shown that these air ventilation systems have resulted in a reduction of air contamination, both during hip and knee arthroplasties. 7

Sterile single-use tourniquet cuffs
By using a sterile single-use cuff, operating theatre staff can be confident they’re offering an improved standard of care to patients. Time’s not wasted re-sterilising, there’s no concern the correct cuff will be available due to reprocessing in the CSSD, clinical audits are easier to adhere to and cross contamination between patients is non-existent. The cost of single-use tourniquets is important to consider, however, with a surgical site infection costing between £263 to over £30,000, a disposable tourniquet cuff may offer a cost-effective method of prevention.

Fig.2 - Anitibiotics.

Hygiene in Healthcare
Hygiene plays an important role in healthcare with constant work being done to reduce healthcare-associated infections (HAIs). However, as technical knowledge increase, leading to more advanced surgical procedures, the risk of HAIs is ever increasing. Additionally, as the use of antibiotics increases so does the number of resistant bacteria.

Over the past decade government agencies and consumer watchdog groups have reported that tens of thousands of lives are lost each year as a result of avoidable incidents in hospitals. Wrong site surgery and surgical site infections (SSIs) are highlighted in many of these reports. SSIs affect thousands of patients each year and contribute greatly to the morbidity and mortality associated with surgery. SSIs are the third most commonly reported HAI, and account for a quarter of all HAIs. HAIs can result in over £40,000 in additional health care costs per patient, and hospitals generally do not receive full reimbursement for costs associated with HAIs. 4

Sterile single-use tourniquet cuffs provide a cost-effective solution?
Freelance Surgical Ltd have distributed the VBM range of disposable tourniquet cuffs for over 10 years. It’s economical and provides a solution to the infection risks associated with reusable cuffs. Promoting best practice, Freelance Surgical Ltd supports their product with a ‘Tourniquet Application’ training service, available to all operating theatre staff.

Our range of sterile single-use cuffs are easy to place due to their conical design and are suitable for all body shapes. The colour coded boxes, in conjunction with colour coded measuring guide, make ordering easier and simplify the process of selecting correct sizes. Freelance Surgical Ltd, also distributes the VBM range of pneumatic and electric tourniquet machines, exsanguinators and pressure infusion cuffs.

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Healthcare-associated infections can result in more than £40,000 in additional health care costs per patient
Antibiotics are commonly used in most cases to help cure bacterial infections (fig.2). However, excessive and incorrect use of antibiotics is causing the bacteria in circulation to build up resistance. The more we use antibiotics, the faster this resistance increases. With this increased resistance it becomes harder to cure.
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