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THE REMARKABLE IMMUNITY OF THE INDIAN PATIENT

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ABSTRACT

Post-operative infection is a dreaded complication of any surgery, more so with an arthroplasty, leaving the surgeon and patient with few options. Antibiotic prophylaxis in arthroplasty is a therapeutic gray zone with no consensus on their role, timing, dosage and type. Most large studies show a 1-2% infection rate for arthroplasty. Multinational prosthesis companies insist disposable instrument sets, disposable helmet systems and modular operation theaters (OTs) are paramount to good results, especially in arthroplasty. Our operating conditions being far from ideal, have a surprisingly low infection rate. Our OT is just an ordinary room with no laminar flow, no special flooring and poor air-conditioning. Reusable washable autoclaved cotton gowns and sheets were used. The OT and patient rooms are fumigated before every surgery. Linezolid and amikacin were used for prophylaxis. We reviewed 78 consecutive arthroplasty patients with 100 joints (hips and knees) that fit our criteria with a minimum follow-up of one year. This may suggest that if we had achieved infection rates on par (<1%) if not better than the best centers in the world at one-fiftieth of the cost (< $1000 vs. ~$50000) it may be of great value to review factors that lead to infection.Additionally, it could be encouraging to smaller centers without state-of-the-art theaters, to be courageous in starting with joint replacements.

KEYWORDS: Immunity, India, Arthroplasty, Joint Replacement, Infection Rate, Operation Theaters

Asepsis is employed to curtail the threat of introducing pathogens into surgical wounds. It protects the patient from the impact of healthcare-related infections such as delayed recovery, lengthier hospitalization, increased pain and morbidity. It should never be compromised for the sake of the convenience of the caregiver. An emergency in which asepsis becomes a secondary concern is a rare occurrence.(Phillips, 2017) Bacterial shedding, wound contamination and clinical-infection rates in clean wounds are influenced by operating-theatre dress code.(Hubble *et al.*, 1996)

A study showed a 22-fold increase in colony-forming units (CFUs) on settle plates at waist height when neither cap nor mask was worn, a 15-fold increase when a cap but no mask was worn and a fourfold increase with a mask but no cap in vertical laminar airflow enclosures, although air sample counts remained low and concluded that theatre-air sampling alone does not reflect local contamination when a surgeon stands over a wound in a vertical laminar-flow enclosure, and both caps and masks are an important part of the dress in such environments.(Hubble *et al.*, 1996)

Multinational companies tend to impress upon studies suggesting that disposable instrument sets, disposable helmet systems and modular OTs are essential to good results especially in arthroplasty though studies show higher intraoperative contamination of surgical helmet systems even in laminar airflow OTs compared to standard surgical gowns. Maybe the pressure difference in the suit is to blame but none the less several institutes use it during arthroplasty.(Shirley *et al.*, 2017) Post-operative infection is a dreaded complication of any surgery, more so with an arthroplasty, leaving the surgeon and patient with little option. The minimal infecting dose decreases more than 10^5 fold in the presence of a foreign body like an implant or prosthesis.(Rao and Ziran, 2020)

An extensive search for the duration in defining post-op infection failed, with various sources mentioning variable time frames. Our operating conditions are the highlight of this paper being far from ideal.

MATERIALS AND METHODS

We conducted a retrospective study in a tertiary government hospital in India. Patients that passed away from unrelated causes and those lost to follow-up were excluded from the study. Minimum follow-up of one year was ensured. A final tally of a hundred consecutive primary arthroplasties (37 hips & 63 knees) that fit our criteria were reviewed for postoperative infection from

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2017-2019. Whenever cement was used it was antibiotic laden cement (500mg gentamycin). All surgeries were carried out by a single principal surgeon.

THE AMBIGUITIES AND AMBIENCE

Modernization, especially on the infrastructure and instrumentation frontier, seems not to have caught up with several government hospitals and our institute is no exception. The preoperative preparation the night before surgery included using depilatory cream, scrubbing the limb with Povidone Iodine Scrub (7.5%), Povidone Iodine solution (10%) and surgical spirit at least twice with each and draping the limb in sterile sheets to be opened on the operation table the following day. The operation theater was fumigated overnight before every case (only one replacement was done as the first case on one operating day). The surgical team included one professor (chief surgeon), one assistant professor, one or two senior residents (registrars), one final year junior resident, one implant technician and one scrub nurse. All members used common bathing soap to scrub with no further antiseptic. Double gloves were used as a routine. Reused autoclaved absorbent cloth gowns were used by some members of the surgical team if there was the unavailability of disposable ethylene oxide (EO) sterilized nonabsorbent gowns. EO sterilized nonabsorbent surgical drape was used on top of recycled autoclaved cloth drape sheets. Incise drape was additionally used. There was no separate scrubbing team and the junior operating team members took turns to scrub the patient on the table. After anesthetic clearance, 3 alternate coats of Povidone Iodine (10%) and surgical spirit were used on the part.

Pulse/Jet lavage was used for all knee replacements and rarely for the hip procedures (cemented). Neither a surgical helmet system nor a face shield was used for any of the cases, only a simple disposable cap and mask were used. The stainless-steel instruments were reused for every case and were autoclaved, while the actual prosthesis (Stryker systems, USA) came pre-sterilized. The cautery/diathermy pencil and suction tip were reused after sterilization by formaldehyde gas (formalin tablet), while the suction tube was boiled and reused.

The theater does not boast of laminar airflow and the air conditioning is primitive and not working most of the time hence ceiling fans were used. The average operating temperature at the table was around 35°C due to old overhead lights. A separate corridor for dirty linen was absent. The theater had a rough cemented floor with no special tiles.There was no control over the movement of personnel into the theater or on the anesthesia team using their face mask properly. The barrier between the trolley and instruments was two layers of cotton cloth.

A negative suction drain was placed in every case before closure. Dry gauze dressing was used and secured with sticky paper tape. Drain out was performed after 2 days of surgery and suture/staple removal was done after 12-14 days of surgery. Two doses of Linezolid 600 mg (preoperative antibiotic) were given 12 hours and 4 hours before surgery and postoperative antibiotics, parenteral linezolid (600 mg twice daily) and amikacin (500 mg twice daily) were given for 5 days and then switched to oral linezolid (600 mg twice daily) for a week (till suture removal).No antibiotics were administeredintraoperatively or after suture removal. After surgery, most patients were transferred to isolation/separate rooms that were fumigated overnight. No postoperative anticoagulation was instituted if the patient was not on any such medication preoperatively for other reasons. There was no control over the patients' smoking or drinking habits after they were discharged.

RESULTS

We reviewed 78 patients with 100 joints (both hips and knees). The mean age was 54 years (Range 22-81 years). There were 40 females and 38 male patients. Five patients had a BMI > 30. The average operating time was 62 minutes from incision to closure. Two patients had rheumatoid disease and were taking DMARDs pre- and post-op barring the perioperative period of 2 weeks. Two patients had ankylosing spondylitis. All the other patients had osteoarthritis (OA), causes included post-traumatic, avascular necrosis and sequelae of joint tuberculosis. One-tenth (8/78) of the patients were immunocompromised (diabetic or hepatitis B/C). The mean follow-up duration was17.3 months.

1 out of 100 joints developed a post-operative infection. The patient was operated on for secondary OA following sequelae of tuberculosis hip. After 6 months of surgery, she developed a deep abscess at the operative site. Incision, drainage and testing showed tuberculosis infection. She was managed by surgical debridement and joint lavage twice in three months and a five-drug anti-tuberculosis treatment (Isoniazid, Rifampicin, Pyrazinamide, Ethambutol and Streptomycin). She recovered well and was off antibiotics for more than a year without signs of recurrence. The rest had no signs of infections and recovered uneventfully.

DISCUSSION AND CONCLUSION

Antibiotic prophylaxis in arthroplasty is a therapeutic gray zone with no consensus on their role, timing, dosage and type. Several antibiotics have been used in the post-operative period including but not limited to teicoplanin, cefuroxime, vancomycin, tobramycin, gentamycin, etc. 1-2% of joint replacements develop an infection in the United States and Germany.(Voigt, Mosier and Darouiche, 2015) A recent meta-analysis of 4036 patients did not show the efficacy of postoperative antibiotic prophylaxis for the prevention of surgical-site infections in patients undergoing total hip or knee arthroplasty.(Thornley *et al.,* 2015) Another recent study with over 18800 patients had at least a one percent rate of SSI at 30 days.(Ponce *et al.,* 2014) A meta-analysis of > 11000 patients concluded that antibiotic prophylaxis reduced the absolute risk of wound infection by 8% and the relative risk by 81% compared with no prophylaxis.(AlBuhairan, Hind and Hutchinson, 2008) Our observation concurs with a study showing that a dormant hip following tuberculosis that completed treatment can result in a recrudescence of the disease following hip replacement.(Kumar, Garg and Malhotra, 2015)

The authors wish to highlight that utmost care possible to ensure asepsis every time ensured no infection despite the warzone like conditions in the operation theater and renounce the extra expenditure in form of 'space suits' or helmet systems. Additionally, it could be encouraging to smaller centers without state-of-the-art theaters, to be courageous in starting with joint replacements. It is with pride we can say that we have achieved infection rates on par if not better than the best centers in the world at one-fiftieth of the cost (< $1000 vs. ~$50000) .(What You Need to Know About the Cost of Knee Replacement Surgery, 2015)

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