



Surgical site infection surveillance following total knee arthroplasty: Tertiary care hospital experience



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ARTICLE INFO

Keywords:

Surgical site infection
Total knee arthroplasty
Aseptic discipline
Surgical technique
Post-discharge surveillance

ABSTRACT

Introduction: Surgical Site Infection (SSI) after knee arthroplasty is a major cause of morbidity and mortality that increases the hospital stay, financial burden and mental anguish of the patient. Infection Control Unit at Aga Khan University Hospital (AKUH) incorporated total knee arthroplasty in its surgical care surveillance program and started collecting data in June 2012. The purpose of this study is to review Surgical Site Infection (SSI) rates in patients undergoing primary total knee replacement (TKR) surgery.

Patients and methodology: All patients from June 2012 to December 2013 undergoing knee arthroplasty at our hospital were included. Data was acquired from the hospital SSI database for knee arthroplasty surgery. Data was collected by SSI nurses for inpatients as well as post-discharge monitoring in clinics till 90 days post-op follow-up. The work has been reported in line with the PROCESS criteria.

Results: During this time period a total of 164 patients had primary TKR at AKUH. Out of these, 85 patients (52%) had bilateral TKR while 79 (48%) had unilateral TKR. The overall SSI was in 2 patients (1.2%).

Conclusion: Identifying SSIs is multidimensional. Since our 2 infected cases after TKR occurred after discharge, this highlights the importance of post-discharge surveillance and not limiting the surveillance for inpatients only. Furthermore, the SSI program may be effective in controlling postoperative wound infections.

1. Introduction

Surgical site infection (SSI) is one of the most common nosocomial infections. It is a major cause of morbidity and mortality which may increase the hospital stay, financial burden and mental anguish of the patient [1]. The overall incidence of SSI for THR (total hip replacement) and TKR (total knee replacement) is 1.69% and 2.82% respectively. It increases up to 3.68% in revision hip surgery [2]. Low incidence of infection is directly related to design of the operating theatre, meticulous surgical technique and rigorous aseptic discipline.

Surveillance has an important role in the reduction of the risk of infection. Yokoe et al. pointed out the limitation to the reporting of SSI by hospitals as they only bank on the readmissions and up to 17% of the SSI would have been missed to be reported [3]. Various Surveillance Systems have been set up in different countries (USA, Germany, etc.) with the aim of decreasing the incidence of SSI [4], generating a national database and data collection is performed by trained infection control personnel using uniform surveillance protocols. Aga Khan University Hospital (AKUH) has developed guidelines for surgical care surveillance and the Infection Control Unit started monitoring this data

for total knee arthroplasty starting from June 2012 onwards. In this paper we report the SSI results of the patients undergoing total knee arthroplasty.

1.1. Patients and methods

Hospital ethical review committee approval and registration of the study in data registry with research registry UIN 3652 done. All patients from June 2012 to December 2013 undergoing total knee arthroplasty at our university tertiary-care hospital were included. Our exclusion criteria was for pathological fractures and revision cases. Patients were admitted after preoperative assessment in clinic and medical optimization if needed. All cases were operated by senior surgeons in our orthopedic team with experience more than 10 years and previous training in the arthroplasty subspecialty. All patients received weight-adjusted first generation cephalosporin in the preoperative period as per hospital protocol. Surgery done under tourniquet cover. Arthrotomy done via medial parapatellar approach in all cases. Cruciate sacrificing implant was used in all cases as well. Postoperatively physiotherapy started from first postoperative day and wound dressing done as per

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<https://doi.org/10.1016/j.amsu.2018.04.006>

Received 20 October 2017; Received in revised form 2 February 2018; Accepted 5 April 2018

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surgeon's preference (earliest at 3rd postoperative day and delayed up to 5th postoperative day).

Data was acquired from the hospital SSI database for knee arthroplasty surgery. Data was collected by SSI nurses for inpatients as well as post-discharge monitoring in clinics till 90 days post-op follow-ups. SSI nurse sent its compiled report to infection control team. Data on SSI, age, gender, co-morbid, procedure, tourniquet and clipper use, hospital stay, antibiotic duration, post-operative fever, and ASA (American Society of Anesthesiologist) level was acquired from the hospital SSI database. Descriptive analysis was done using SPSS 19 version, Frequencies were calculated for categorical variables. The work has been reported in line with the PROCESS criteria [5].

2. Results

A total of 164 patients underwent primary TKR from June 2012 till December 2013 at our institution, of these, 85 patients (52%) had bilateral TKR while 79 (48%) had unilateral TKR. Mean age of our patients was 62 ± 13 years. 105 (64%) patients were females and 59 (36%) patients were males. The overall SSI was in 2 patients (1.2%). These 2 cases were superficial SSI i.e. infection of skin and subcutaneous tissue but not beyond the fascia and these were managed conservatively with antibiotics. We also looked for various factors related with SSI like age, diabetes, number of co-morbid, use of clipper, post-operative fever, discharge on antibiotics, pre-operative UTI, ASA (American Society of Anesthesiologist) level, duration of surgery, pre-operative hemoglobin and hospital stay as shown in Table 1. The duration of surgery in 19 patients (11.6%) was 119 min or less while 145 (88.4%) patients had duration of 120 min or more, and 2 patients in second group developed SSI (Table 2).

The hospital stay in 90 (54.9%) patients was 7 days or less while 74 (45.1%) patients had hospital stay of 8 days or more, 1 patient in each of these groups developed SSI. Pre-operative hemoglobin (Hb) in 42 (25.6%) patients were 11 g/dl or less while 112 (74.4%) patients had Hb of more than 11 g/dl. Single patient in each group developed SSI. 7 patients (4%) had post-op fever during hospital stay while 157 (96%) patients had no post-op fever, both SSI patients are in second group. 15 (9.1%) patients were discharged on antibiotics while 149 (90.9%) patients were not discharged on antibiotics. 2 patients who were not discharged on antibiotics developed SSI. Clipper was used in 28 patients (17%) while it was not used in 110 (67%) patients and 26 (16%) patients had missing record (Table 2).

3. Discussion

SSI is defined as an infection that occurs after surgery in the part of the body where the surgery took place within 90 days of surgery [6,7]. Surgical site infection may include purulent drainage from incision, positive fluid or tissue cultures on aseptically obtained samples, wound dehiscence or wound reopened by the surgeon in presence of fever, pain or tenderness, localized swelling, and redness. An abscess or other

Table 1
Patients' characteristics.

	N (%)	Patients with SSI	
		Frequency	%
Diabetes			
Yes	86 (52.4%)	0	0%
No	78 (47.6%)	2	2.6%
Pre-Op UTI			
Yes	8 (4.9%)	0	0%
No	156 (95.1%)	2	1.3%
ASA Status			
I-II	120 (73%)	1	0.8%
III-IV	44 (27%)	1	2.3%

Table 2
Variables studied.

	N (%)	Patients with SSI	
		Frequency	%
Co-morbid			
Single or none	63 (38%)	1	1.6%
Two or more	101 (62%)	1	1%
Surgery duration			
< 119 min	19 (1.6%)	0	0%
≥ 120 min	145 (88.4%)	2	1.4%
Hospital stay			
≤ 7 days	90 (54.9%)	1	1.1%
≥ 8 days	74 (45.1%)	1	1.4%
Pre-op hemoglobin			
≤ 11 g/dl	42 (25.6%)	1	2.4%
> 11 g/dl	112 (74.4%)	1	0.8%
Post-op fever during hospital stay			
Yes	7 (4.8%)	0	0%
No	157 (96%)	2	1.3%
Discharged on antibiotics			
Yes	15 (9.1%)	0	0%
No	149 (90.9%)	2	1.3%
Clipper used			
Yes	28 (17%)	1	3.6%
No	110 (67%)	1	0.9%
Record not available	26 (16%)	0	0%

evidence of infection is found on direct examination, during reoperation, or by histopathology or radiologic evidence [8] [9].

The patients who developed SSI were not found to be associated with age, diabetes, number of co-morbid, pre-op UTI, post-operative fever, duration of surgery and duration of hospital stay, use of clipper, pre-operative hemoglobin, ASA level, and discharge on antibiotics. Clinical governance has increased awareness of the importance of quality and the need for monitoring outcomes by developing surveillance systems. However, surveillance in developing countries remains inadequate and inaccurate [4]. Many hospitals have developed local audit systems to focus on particular issues, but data collected by hospitals participating in the surveillance service allowed comparisons to be made with other institutions. Troillet et al. reported the 5 years results of Swiss national surgical site infection (SSI) surveillance program, They pointed out that post discharge surveillance is essential, it may cause the reporting of higher infection rate than previous but it also impels the surgeon to improve the quality without which the ultimate outcome cannot be improved [10].

Song et al. [11] pointed out that longer duration (13 days) of pre-operative hospital stay, diabetes mellitus, revision surgery, prolonged duration of surgery (175th percentile), and trauma as the reason for surgery were independent risk factors for total and severe SSI after Total Hip Arthroplasty [4], whereas male sex and an operating room without artificial ventilation were independent risk factors for total and severe SSI after Total Knee Arthroplasty (TKA). In another study, diabetes mellitus was pointed out as a risk factor for prosthetic joint infection after TKA and THA [12]. Another study by Crowe et al. showed that ASA, duration of surgery and the presence of various co-morbid were not found to be associated with prosthetic joint infection (PJI) while obesity along with tobacco use were associated with PJI [13] while Peel et al. in his study showed that ASA along with higher post-operative drain tube loss is associated with PJI [14]. In our study, we looked at some of these parameters but none of them were found to be significant, could be due to the small sample size. Brandt et al. [15] reported that ventilation with laminar airflow was not beneficial and was even associated with a higher risk of severe SSI after hip prosthesis surgery. Separate operating theatre should be dedicated for ultra clean elective joint replacement. Use of air suits in the operating room further minimizes the rate of infection [16]. Minimizing the operating room traffic also an important factor to be considered.

4. Conclusion

Identifying SSIs is multidimensional. Since our 2 infected cases after TKR occurred after discharge, this highlights the importance of post-discharge surveillance and not limiting the surveillance for inpatients only. As this is a single arm study and with less sample size, we can only generate the hypothesis that SSI program may be effective in controlling postoperative wound infections. Further analytical studies or randomized controlled trials will test this hypothesis and be able to generate strong recommendations.

Ethical approval

Yes, Ethical approval taken by the University ethical review committee.

Sources of funding

None.

Author contribution

Irfan Ashraf: first proposal and draft and conducting the study.
Yasir Muhib: manuscript witting.
Obada Hasan: data analysis and manuscript writing and editing.
Amina Malik: data management.
Khabir ahmad: review and editing.
Shahryar Noordin: review and editing and approval.

Conflicts of interest

No conflict of interest.

Research registration unique identifying number

UIN 3652.

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