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A prospective study to observe the increasing incidence of delayed surgical site infection during the covid pandemic – An article and review of literature

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Abstract

Introduction: Surgical site infection is defined as an infection that occurs after 30 days of surgery with no implant, and in our cases, after 1 year of the surgical procedure in case an implant was inserted, as is the case almost all the orthopedic procedures. These infections are classified as incisional occurring at the suture site, or organ or space infections occurring at those sites manipulated during the surgery. These infections, caused by multifactorial reasons, are a major cause of morbidity for the patient and costly given the need for repeat hospitalization and their subsequent management.

Materials and methods: We have a prospective study of 30 patients who presented to us 1 year after their orthopedic surgical procedure including patients operated from January 2020 to March 2020 with a surgical site infection, in particular an incisional site infection. They were managed with in accordance with the severity of infection – namely superficial and deep, with just IV antibiotics and high protein diet for the former with an additional surgical procedure in the form of debridement for the latter. Results: 18 patients [60%] required surgical debridement as they had a deep incisional infection. 12 patients [40%] were managed with only IV antibiotics according to culture sensitivity report. All 30 [100%] patients were discharged with a healthy wound with no signs of infection after.

Conclusion: Delayed surgical site infection is a known but catastrophic complication of any surgical procedure with multifactorial causal relationship between them. As we have seen in this study which includes patients operated between January and March 2020, which just coincides with the onset of COVID-19 Pandemic in the country, patients who were otherwise healthy and were discharged with a healthy wound presented after 1 year with a surgical site infection which could attributed to an apparent reduction in immunity due to a full blown or a sub-clinical COVID-19 infection along with few social and economic factors considered here in this article.

Keywords: Delayed surgical site infection (SSI), purulent discharge, debridement, irrigation,

Introduction

Surgical site infection is defined as an infection that occurs after 30 days of surgery with no implant, and in

our cases, after 1 year of the surgical procedure in case an implant was inserted, as is the case almost all the orthopedic procedures. These infections are classified as incisional occurring at the suture site, or organ or space infections occurring at those sites manipulated during the surgery. Among the incisional site infections – further they are classified as superficial and deep with the deep being obviously severe in intensity presenting with aggressive symptoms and signs causing significant morbidity to the patient. These infections, caused by multifactorial reasons, are a major cause of morbidity for the patient and costly given the need for repeat hospitalization and their subsequent management taking a significant amount of time sometimes up to 6-8 weeks for the discharge to completely stop and the wound to completely heal [1,2]. The incidence of surgical site infections varies globally when compared to Indian scenario with the global estimates ranging from 0.5% to 15%, while Indian patients showing a significantly increased incidence ranging from 23% to 38% [3]. Such increased numbers can be influenced by a number of factors such as pre-operative care, the theatre environment, post-operative care and the type of surgery to name a few. There are many other factors which influence wound healing and the potential for incidence of SSI which are further discussed in this article. Surgical site infections can be caused by both endogenous and exogenous organisms. Most often, SSIs are caused by endogenous organisms present on the patients' skin when the surgical incision is made. Among bacteria, gram positive cocci – staphylococcus aureus is the most common causative skin-dwelling organism [4]. The management of surgical site infection with antibiotics and surgical debridement acts as a prelude to the fact that the best management is in the form of prevention of its occurrence, which in turn depends on several factors including the host, the operating surgeon, the operating room and the hospital environment. Depending on the severity, it can be managed either with IV antibiotics alone, or a surgical procedure in the form of debridement, sometimes, multiple, along with IV antibiotics is required, more so in deep incisional infections. Along with this, a major aspect in the treatment of SSIs is increasing and maintaining the nutritional status of the patient, optimizing the patient to obtain adequate hemoglobin levels, maintaining absolute sterility while dressing the wound and optimum mobilization of the patient as allowed by the rehabilitation protocol for that particular surgery to avoid further complication such as lung atelectasis, pneumonia, pressure sores due to prolonged immobilization. By following such basic protocols, it is possible to reduce the hospital stay and eradicate and further prevent the development of re-infection [5].

Materials and Methods

From the period of January 2020 to March 2020, 60 patients (Fig.1) operated in total in the age group of 25-75 years of age, including trauma, arthroplasty, spine, and arthroscopy, out of which 30 were trauma patients – which included both open and closed trauma (50%), 10 patients underwent arthroplasty of the knee and hip joint appropriately (16.66%), 12 patients underwent arthroscopic procedures of the shoulder and knee (20%), 8 patients underwent surgeries relating to the spine (13.33%) (Fig.2). Of those 60 patients operated, we have a prospective study of 30 patients (Fig. 3) who presented to us 1 year after their orthopedic surgical procedure, with purulent discharge from the suture site along with pain as their chief complaint. Of these 60 patients, 28 had developed a RT-PCR positive COVID-

19 infection including those who were symptomatic and asymptomatic sometime in this one-year duration (Fig. 4) Approximately 25% of them (8 patients) presented with additional constitutional symptoms like fever with chills, rigors, malaise, general debility indicating the presence of a severe infection with a probable hematogenous dissemination giving rise to such symptoms. They were appropriately classified as having a delayed surgical site infection, in particular incisional site infection. They were managed with in accordance with the severity of infection – namely superficial and deep, with just IV antibiotics and high protein diet for the former with an additional surgical procedure in the form of debridement for the latter. In these 30 patients, 20 had a history of previous COVID-19 infection (Fig. 5). Out of the 30 patients diagnosed to have delayed SSI, 18 patients were operated for open/closed trauma, 7 patients for spine, 2 patients operated for arthroplasty and 3 patients were operated with arthroscopic procedure of the shoulder or knee (table 1).

Treatment Protocol

A deep SSI was diagnosed when the infection involved fascial and the muscle layers and not just skins the subcutaneous tissues. 8 out of the 12 Patients with deep SSI also presented with constitutional systemic symptoms as described above. As soon as a Deep SSI was diagnosed, the patient was taken up for urgent surgical debridement. Incision was taken over the same site (pervious scar) as was used for the initial procedure. All purulent discharge was drained and sent for culture and sensitivity. The necrotic tissue (muscle, fascia) was also sent for tissue culture sensitivity. After the pus was drained, a thorough irrigation and wash was given in the following order: 1000ml of normal saline (0.9%), followed by 400ml of diluted povidone iodine, 1000ml of normal saline (0.9%), 100ml of hydrogen peroxide followed by 5000ml of 0.9% normal saline at the end. After the wash was given, a suction drain was put in situ and muscle and fascial layers were closed in tight layers followed by subcutaneous tissues and skin [6]. These patients were started on empirical antibiotics following debridement and the antibiotics were later changed according to sensitivity. These were continued further for 4 weeks and were changed to oral antibiotics for 2 weeks. Those patients with superficial SSI were kept on IV antibiotics for 4 weeks and oral antibiotics for another 2 weeks.

Results

In this study, the incidence of delayed SSI was found to be 50% in this study (30/60). It was found to be higher in proportion in those infected previously with COVID-19. 12 [40 %] patients were diagnosed to have a deep incisional surgical site infection and required surgical debridement as the appropriate management along with IV antibiotics. 18 patients [60 %] were managed with only IV antibiotics according to culture sensitivity report as they were diagnosed to have a superficial incisional site infection (Fig. 6). Female affection was found to be slightly more than males (17: 13) the details of which are elaborated in Table 2. Both superficial and deep infections were commoner in females (55.55% and 58.33% respectively) than in males. In 2 patients (operated with short PFN for right sided IT fracture in a 45-year-old female, 55-year-old male operated for left distal femur fracture with distal femur plating) implant removal was done. All 30 [100%] patients were discharged with a healthy wound with no signs of infection after 4 weeks of IV antibiotics followed by 2 weeks of oral antibiotics.

Discussion

Delayed surgical site infection is a rather uncommon but a catastrophic complication which leads to increased morbidity, prolonged hospitalization and more importantly in developing countries – additional costs of getting the adequate and timely treatment for the same. What makes the management of delayed SSI even more challenging is the fact that sometimes, decision has to be taken or it becomes imperative to remove the implant in-situ in order to completely eradicate the infection as the formation of bio-film over the implant makes it almost impossible to manage it with surgical debridement alone. The removal of implant sometimes fails the purpose of the initial surgical procedure in the first place. The most important approach towards the management of any surgical site infection is the primary prevention of the same rather than treating this catastrophic complication causing significant morbidity to the patient. The major principles of preventing a surgical site infection can be broadly divided into 3 categories namely: pre-operative, peri-operative and post-operative care. In pre-operative care are included strategies such as tobacco cessation at least 1 month prior to surgery, glucose control in diabetics with HbA1c within the normal range, hair removal just prior to incision (hair removal 24hrs before the surgery increases the risk of SSI as the it creates micro abrasions over the incision site), pre-operative showering with an antibiotic scrub, pre-operative scrubbing, optimizing the patient with adequate hemoglobin levels and all other lab parameters within range. Peri-operative strategies include avoiding unnecessary staff in the operating room, giving prophylactic antibiotic half hour prior to surgery, prevention of intra-operative hypothermia. Post-operative care becomes utmost important once the procedure is done as that is the time with maximum chances of lax behavior from the patient side as far as the wound care is concerned [7,8,9]. Adequate glucose control in the post-operative period, timely check dresses of the incision site at Post op day 3 and 7, prophylactic IV antibiotics for 1 week followed by oral antibiotics for another week. A high protein diet and early mobilization of the patient helps increasing the general condition of the patient and improves and hasten the wound healing processes. Managing all these aspects in a developing country becomes all the more difficult both for the patient and the operating surgeon. To compound this factor was the COVID-19 Pandemic which struck India in early 2020 around February-March period following which the country went into government regulated restrictions for approximately one and a half year when they were finally starting to relax after the 2nd wave of the pandemic down-slopped. During this period, many of these patients, who came from a lower-middle to lower economical class, lost their livelihoods in the form of jobs, financial savings unable to maintain their daily living including their diet giving rise to general debility and subsequent reduced immunity. Also, given the population of India, with many people living in cramped houses and their inability to maintain social distancing as a norm might have led them to get exposed to Coronavirus causing a subclinical COVID-19 infection leading to a possible decreased immunity warranting further multi-centric studies of the same to validate this statement. Given all these circumstances, the patients who had a previous history of COVID-19 infection were more likely to present with a delayed surgical site infection. Hence, apart from the medical aspects to be taken care of, these

are the various social and economic factors compounded by a COVID-19 pandemic along with its infection could be considered as the precipitating factor for an increased incidence of a delayed surgical site infection.

Conclusion

Delayed surgical site infection is a known complication of any surgical procedure with multifactorial causal relationship between them. As we have seen in this study which includes patients operated between January and March 2020, which just coincides with the onset of COVID-19 Pandemic in the country, patients who were otherwise healthy and were discharged with a healthy wound presented after 1 year with a surgical site infection which could attributed to an apparent reduction in immunity due to a full blown or a sub-clinical COVID-19 infection along with few social and economic factors considered here in this article.

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Legend Figures and Tables

Fig. 1: Pie chart showing proportion of males and femal

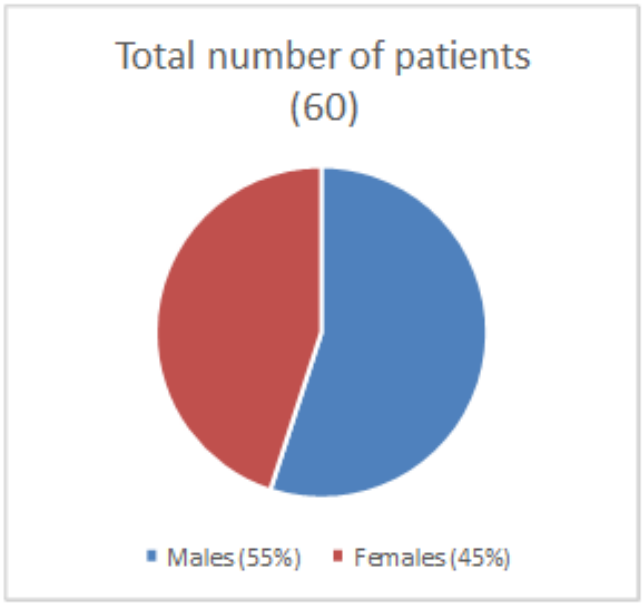

Fig. 2: Pie chart showing proportion of each surgical procedure performed.

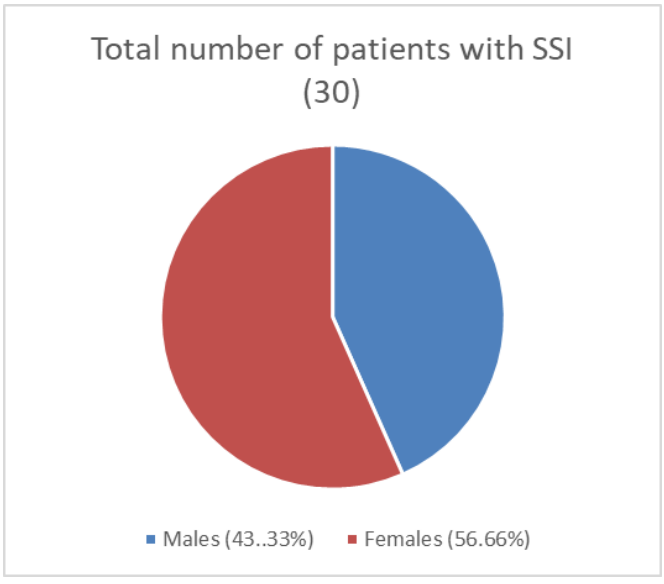

Fig. 3: Proportion of infected males to females.

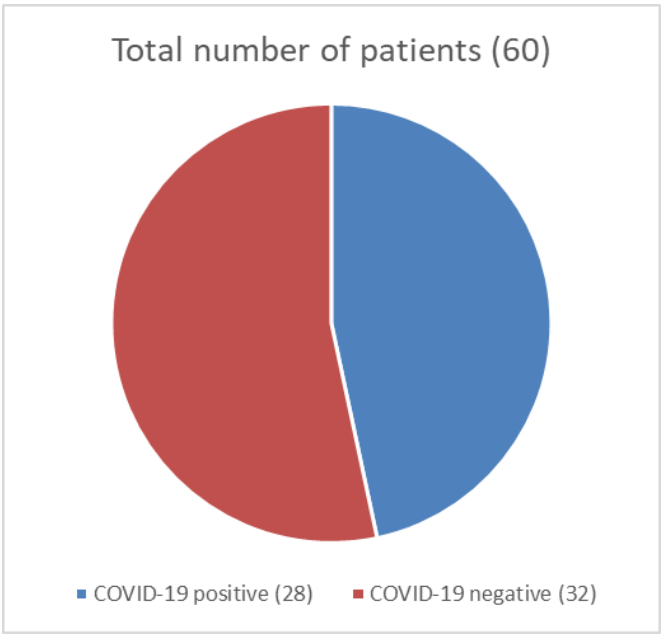

Fig. 4: proportion of COVID-19 Positive to Negative patients.

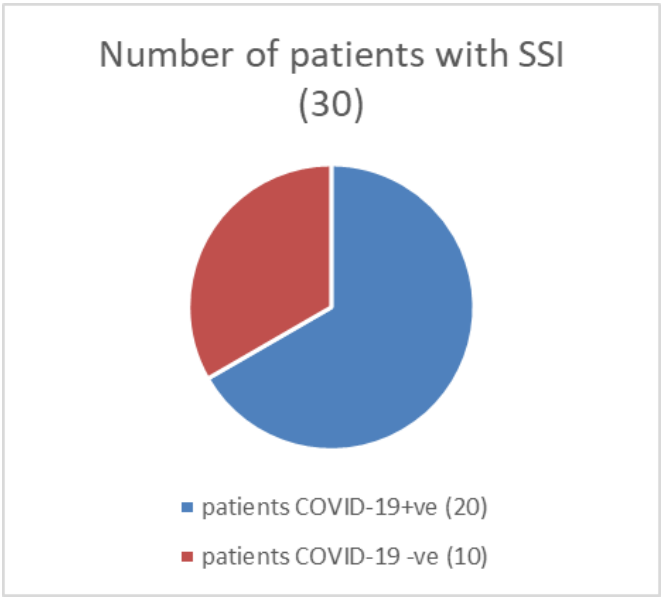

Fig. 5: pie-chart showing higher proportion of delayed SSI in COVID-19 infected patients.

	Trauma	Spine	Arthroplasty	Arthroscopy
Males	8	3	1	1
Females	10	4	1	2

Table 1: Showing the number of infected males and females operated in different domains of surgery.

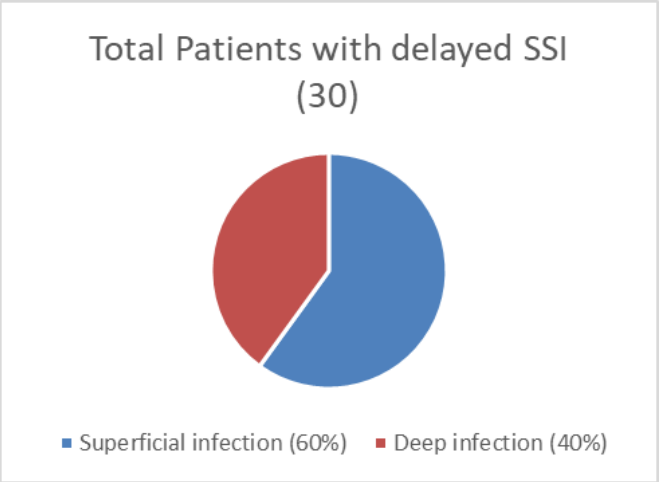

Fig. 6: Pie chart showing proportion and superficial and deep infections.

	Trauma	Spine	Arthroplasty	Arthroscopy
Superficial Infection	Male: 5 Female: 5	Male: 2 Female: 2	Male: 0 Female: 1	Male: 1 Female: 2
Deep infection	Male: 3 Female: 5	Male: 1 Female: 2	Male: 1 Female: 0	Male: 0 Female: 0

Table 2: Showing final result obtained elaborately showing male and female affection in various domains of surgical procedures w. r. t superficial and deep infections.