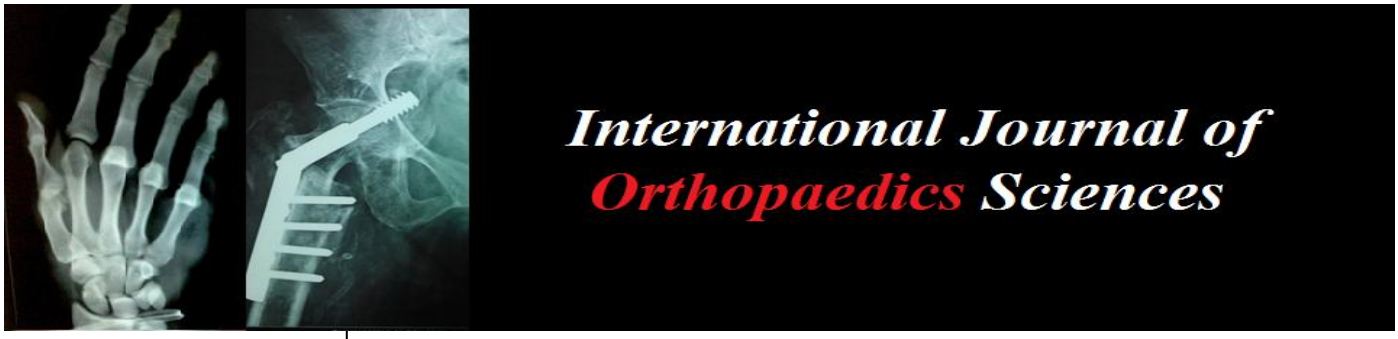

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Dr. Mani Ramesh
Associate Professor, Department of Orthopaedics, Sri Muthukumaran Medical College Hospital and Research Institute, Chennai, Tamil Nadu, India

Dr. Lionel John
Associate Professor, Department of Orthopaedics, Sree Balaji Medical College & Hospital Chennai, Tamil Nadu, India

Dr. Arul Jothi V
Chief Orthopaedic Surgeon, OMS Hospital, Tiruppur, Tamil Nadu, India

Corresponding Author:
Dr. Lionel John
Associate Professor, Department of Orthopaedics, Sree Balaji Medical College & Hospital Chennai, Tamil Nadu, India

Profile of suction tip and drain fluid culture and wound infections in Orthopedic surgeries

Dr. Mani Ramesh, Dr. Lionel John and Dr. Arul Jothi V

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Abstract
Background: Post operative infections remains major problems for any surgeon. In orthopedic surgery, post operative wound infection carries high morbidity and mortality. Most of these infections are bacterial origin and thought to be due to wound contamination at the time of operation. Hence this study was conducted to assess the growth of organisms from suction tip and drain fluid.
Methods: This cross sectional study was done among the patients undergoing orthopedic surgery in the department of orthopedics at Sri Muthukumaran Medical College and Research Institute during January 2018 to January 2020. A total of eighty post operative cases were included in the study. Following the surgical procedure the suction tip culture and drain fluid cultures were sent for analysis. The reports of the same were also entered in the proforma. Data entry was done in Microsoft excel and statistical analysis was done using SPSS version 20.
Results: In this study, 6(7.5%) cases had wound infection. Among them 5(83.3%) and 1(16.7%) cases had superficial and deep wound infections. On assessing the suction tip culture, positive and negative reports were noted in 15% and 85% of cases, respectively. Drain fluid culture showed 8.7% and 91.3% cases with positive and negative reports, respectively.
Conclusion: A positive report will enable the surgeon to keep a close watch on the wound behaviour and intervene earlier, if necessary and a negative culture does not ruled out the infection.

Keywords: Suction tip, drain tube, culture, orthopedic surgery

Introduction
Post operative infections remains major problems for any surgeon. In orthopaedic surgery, post operative wound infection carries high morbidity and mortality. Most of these infections are bacterial origin and thought to be due to wound contamination at the time of operation, the incidence of which has been reported to be as high as 58% [1]. The majority of these bacteria are removed by local wound defence mechanisms. Prophylactic antibiotics may also have a role in this bacterial clearance [2, 3]. The presence of bacteria in the wound during the early hours following surgery may be due to their incomplete elimination and may be viewed as a high risk factor for subsequent wound infection [4].
A surgical wound may get infected by the exogenous bacterial flora which may be present in the environmental air of an operation theatre or by the endogenous flora [5]. The infection rate following total joint replacements has declined to below 1% [6]. SSI in Orthopaedic surgeries are disastrous and often lead to significant morbidity and mortality [7].
Bacterial colonisation of the drain track via retrograde migration increases as long as the drain remains in situ, particularly beyond 24 hours [8]. As volumes collected in closed suction drains after total joint arthroplasty are minimal after 24 hours, many surgeons remove drains early to reduce the risk of wound contamination [9].
Drain tubes that are kept in close proximity to the bone or implants to drain the extracellular fluid and haematoma and in turn it enhances faster wound healing. Many surgeons consider wound haematoma to be an ideal medium for bacterial colonisation and post-operative infection. In their views, suction drainage is the best method to get rid of any blood that may accumulate in surgery involving the medullary bone [10]. However, recent studies question the role of drains in uncomplicated orthopaedic operations and some surgeons consider them unnecessary [11, 12].

In spite of this controversy, drains are still widely used in orthopaedic surgery. Hence this study was conducted to find the profile of suction tip and drain fluid cultures and the occurrence of wound infections following orthopedic surgeries.

Objectives

To find the profile of suction tip and drain fluid cultures and the occurrence of wound infections following orthopedic surgeries.

Methods

This cross sectional study was done among the patients undergoing orthopedic surgery in the department of orthopedics at Sri Muthukumaran Medical College and Research Institute. Patients with endocrine disorders, metabolic syndreome and immunocompromised individuals were excluded from this study. The study was conducted from January 2018 to January 2020. A total of eighty post operative cases were included in the study.

Written informed consent was gathered from the patients before the conduct of study. Patients were assessed and detailed history was collected by the principal investigator. The clinical history and examination were noted in a proforma. Following the surgical procedure the suction tip culture and drain fluid cultures were sent for analysis. The reports of the same were also entered in the proforma. Data entry was done in Microsoft excel and statistical analysis was done using Statistical Package for Social Sciences, version 20.

Results

In this study majority of the study participants (28.7%) were in the age group of 51-60 years followed by 31-40 years (23.8%), 41-50 years (18.8%), ≤ 30 years (15%) and > 60 years (13.7%). The mean age of the study participants was 49.45±19.7 years. Also majority of the study participants were males (73.8%) and only 26.3% were females. (Table 1)

Table 1: Age and gender of the study participants

Variable	Frequency	Percentage
Age group		
≤ 30 years	12	15
31-40 years	19	23.8
41-50 years	15	18.8
51-60 years	23	28.7
> 60 years	11	13.7
Gender		
Male	59	73.8
Female	21	26.3

Majority of the study participants (83.8%) underwent open reduction and internal fixation followed by 5% underwent replacement procedures, 3.8% had osteotomy and 2.5% underwent hemiarthroplasty of hip and other surgical procedures includes 5% of cases.

In this study, 6(7.5%) cases had wound infection. Among them 5(83.3%) and 1(16.7%) cases had superficial and deep wound infections. (Figure 1)

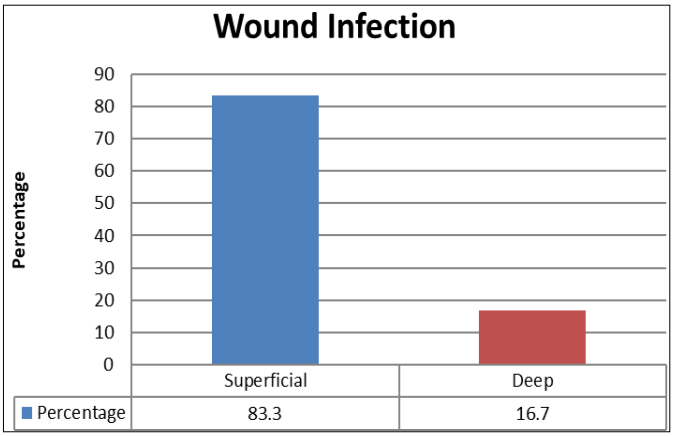

Fig 1: Proportion of Superficial and deep infection among the infected cases

On assessing the suction tip culture, positive and negative reports were noted in 15% and 85% of cases, respectively. Both suction tip culture positive and wound infection was present in 6.3% of cases, suction tip negative and infection present in 1.3% of cases, suction tip positive and infection absent in 8.8% of cases and both suction tip negative and infection absent in 83.8% of cases. Similarly, both drain fluid culture positive and wound infection was present in 3.8% of cases, drain fluid culture negative and infection present in 3.8% of cases, drain fluid culture positive and infection absent in 5% of cases and drain fluid culture negative and infection absent in 87.5% of cases. Only five cases (41.7%) developed infection out of twelve positive suction tip cultures and only three cases (42.9%) developed infection out of the seven cases with positive drain fluid cultures. (Table 2)

Table 2: Suction tip and drain fluid culture with respect to wound infection

Variable	Wound infection		Total
	Present	Absent	
Suction tip culture			
Positive	5 (6.3)	7 (8.8)	12 (15)
Negative	1 (1.3)	67 (83.8)	68 (85)
Total	6 (7.5)	74 (92.5)	80 (100)
Drain fluid culture			
Positive	3 (3.8)	4 (5)	7 (8.8)
Negative	3 (3.8)	70 (87.5)	73 (91.3)
Total	6 (7.5)	74 (92.5)	80 (100)

Among the suction tip cultures which showed growth, the organisms found were Staphylococcus aureus (58.3%), Pseudomonas aeruginosa (16.7%), Klebsiella pneumonia (16.7%) and Coagulase negative staphylococci (8.3%). Similarly in drain fluid cultures, Staphylococcus aureus (71.4%) and Pseudomonas aeruginosa (28.6%) were reported. (Table 3)

Table 3: Organisms isolated from suction tip and drain fluids

Organisms isolated	Positive suction tip culture N (%)	Positive drain fluid culture N (%)
Staphylococcus aureus	7 (58.3)	5 (71.4)
Pseudomonas aeruginosa	2 (16.7)	2 (28.6)
Klebsiella pneumonia	2 (16.7)	0
Coagulase negative staphylococci	1 (8.3)	0
Total	12 (100)	7 (100)

Discussion

Closed suction drainage has become an established routine with the aim of preventing wound hematoma and thereby reducing the risk of infection [13]. The use of closed suction drainage reduces the retrograde migration of bacteria along the drain tract and, therefore, reduces the frequency of infection, compared with the use of simple conduit drains [14]. Suction drain tips, which are in close contact with the bone and implants are considered to be the ideal "swab" for detection of microbes in the wound during early postoperative period [15].

In a prospective study by Overgaard *et al.* [16] of 81 primary total hip arthroplasties in 78 patients, 68 drains were removed within 48hour with no risk of developing wound complications and the reason for which could be the short drain period, and prophylactic antibiotics administration until the drain track becomes dry.

Drain tip culture was positive in 3.39% of drains and wound culture in 2.26% of surgical wounds. The different culture positive rate in different studies may be due to routine administration of intravenous antibiotic prophylaxis for three post-operative days and the technique of drain removal and culture might have been the cause for variation [17]. Sankar states wound infection was significantly related to positive suction tip culture but not to positive drain fluid culture [15].

Experimental and clinical studies have shown that use of closed suction drainage reduces the retrograde migration of bacteria along the drain tract and, therefore, reduces the frequency of infection, compared with the use of simple conduit drains [18, 19]. If drainage is maintained for longer periods, the risk of bacterial contamination following aseptic surgery also is not clear. Zamora *et al.* [20] found that there was no correlation between the length of time that a drainage tube remained in place and contamination of the surgical site.

Bernard *et al.* [14] and Sorensen *et al.* [4] stated that systematic bacteriological culture of drainage fluid in clean orthopedic surgery is not useful for the detection of infection. Studies conducted by Girvent *et al.* [21] stated that they found no relation between positive tip culture and wound infection. But Sorensen *et al.* [4] analysing 489 cases found a positive correlation between the two.

Lawal *et al.* [22] reported that postoperative wound drains make for neat postoperative period with less tissue swelling. There was no statistically significant differences between the drained and undrained wounds in terms of infection rates, haematoma or seroma formation.

Robinson *et al.* [23] assessed the suction tip cultures and found that 41% of them had evidence of bacterial colonisation with one or more bacteria. Ahn *et al.* [24] stated that suction drain tip culture analysis is a poor predictor of SSI after primary posterior spine surgery Sorensen *et al.* [4] reported that positive drain-tip cultures were seen after 56 operations, and of these, five were followed by infection. Staphylococcus aureus, Enterobacteriaceae, or Streptococcus faecalis was cultured from drain tips. Drain-tip cultures growing only coagulase-negative staphylococci, nonhemolytic streptococci, and corynebacteria were not correlated with increased risk of infection.

George *et al.* [25] reported that suction tip cultures had *Staphylococcus aureus* and *S. epidermidis*. But, no infection was recorded in any of the eight patients whose cultures found positive. Takada *et al.* [1, 26] reported that drain tip cultures were positive in 0.8% of cases. SSI was found in 0.3% of cases, where the drain tip cultures were all negative.

Conclusion

A positive report will enable the surgeon to keep a close watch on the wound behaviour and intervene earlier, if necessary. Also a negative culture does not ruled out the infection. Further studies are required to determine whether culture of drain tips can predict late infections and to analyse the benefits of early intervention in infected surgery.

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Declarations

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