ORIGINAL ARTICLE

Frequency of infection in closed fractures managed by open osteosynthetic material and its outcome

Kifayatullah, Shoaib Zardad, Muhammad Shoaib Khan

Abstract:
Objectives: To know the frequency of infection in closed fractures fixed with osteosynthetic material and the effect of soft tissue injury score.
Study Design: prospective study of 100 patients, having closed fractures of long bones.
Methods: 100 patients having fractures of long bones fixed with osteosynthetic material and were followed for a period of one year for any infection.
Results: A total of 78 patients could follow for one year and infection was noted in 5(6.5%) patients. Staphylococcus aureus was the commonest organism isolated.
Discussion: Infection is different in different hospitals and is also dependent on other variables. Infection rate also varies by using different classification criteria.
Conclusion: The more the soft tissue injury scores the more the frequency of infection. The AO soft tissue injury score of IC4 and IC5 should be treated by means other than open osteosynthetic material.

Keywords: frequency of infection, closed fractures, soft tissue injury score.

Introduction:
Infection can occur in almost any sort of surgery and can be reduced with different measures but cannot be eliminated altogether. It has been observed by different researchers that the use of osteosynthetic material has an increased frequency of infection in orthopedic surgery [1, 2]. Complications are many but infection is the one, which can be disastrous and the surgeon and patient both are annoyed with. Infection can be superficial or deep and similarly early or late. Superficial infection is that which is superficial to the deep fascia and deep infection is that which is deep to the deep fascia. Deep infection can be diagnosed clinically and by laboratory investigations, histopatholgy, culture and sensitivity and imaging studies. Imaging studies can be ultrasonography; bone scans MRI and CT scan[4]. The commonest organism involved in most series is Staphylococcus Aureas.[9] Infection is said to be early when seen less than two weeks, late when found in 2-10 weeks and delayed when diagnosed after 10 weeks [6, 7].

With the use of prophylactic antibiotics and by the introduction of ultra clean operation theater the infection in most such centers has been reduced to a minimum of one percent but varies between 0.7 and 8.8 % in clean orthopedic surgery [1,3]. As we are lacking these modern operation theaters with High Efficiency Particulate Air filters (HEPA), our results cannot touch the international standards. The difference in the incidence varies due to the type of operation and the patient's susceptibilities too[5].

The frequency of infection also closely correlates with the different types of soft tissue injuries. There are different classification systems such as that of Tscherne and Gotzen which is followed by the AO group for this classification system in closed fractures soft tissue injury [5, 6]. Skin lesions in closed fractures i.e. Integument closed is classified as: IC1, skin undamaged, IC2 has contusion of skin, IC3 has local degloving, IC4 has extensive closed degloving and IC5 has skin necroses as a result of contusion[8].

Department of Orthopedics, Bacha Khan Medical College Mardan.
Kifayatullah
S Zardad
MS Khan

Correspondence:
Dr. Kifayatullah FCPS (Ortho), Assistant Professor Orthopedics, Bacha Khan Medical College Mardan.

Materials and methods:
This prospective study was conducted in the orthopedic department of Ayub Teaching Hospital Abbottabad from Jan 2009 to Nov 2009.A total of hundred patients of either gender were included in the study. The data was recorded on a proforma regarding age, sex, cause of fracture, site involved, type of fracture and type of closed soft tissue trauma. Duration of surgery, implant used and senior or junior surgeon were recorded also.

Cephradine was used as prophylactic antibiotic at the time of induction of anesthesia in all cases, and postoperatively continued for 48 hours and then orally at home for a week. In the proforma there was a provision for the entry of any complication encountered preoperatively and postoperatively. The infection was diagnosed clinically and evaluated radiologically and confirmed by culture and sensitivity of the ooze, aspirate or pus.

The patients were followed for a total period of one year, fortnightly for first month and monthly subsequently. Infections encountered were rated superficial or deep and early or delayed. Superficial infections were treated with antibiotics and washing with normal saline. Deep infections were treated with debridement and washing with normal saline and pyodine solution and antibiotics. Osteomylitis was managed as deep infection added with implant removal.

Results:
A total of 100 closed fractures of long bones that were managed by open osteosynthetic material, 82 were males and 18 were females, having a ratio of 4.6 to 1. The age range was 13-75 years and 71% were young i.e. less than 40 years. Sixty percent fractures were caused by road traffic accident 34% by fall from height and the rest by other means.

According to AO classification 63% were type A fractures, 29% type B and 8% were type C fractures. Soft tissue trauma score was IC1 injury 71%, IC2 injury 19%, IC3 injury 5 %, IC4 injury 3% and IC5 injury 2%.

A total of 78 patients could follow for one year. Out of these 78 patients 5(6.4%) patients developed infection. Two infections were superficial one patient had deep wound infection and two patients developed osteomyliitis. The superficial and deep infections were treated with antibiotics after culture sensitivity and all cured. The patients having osteomylitis after K.nailing of Femur and plate and screw fixation of tibial fractures ended in infected non-union inspite of aggressive management. These two cases were managed by removal of the implants, debridements and Illizarrov external fixators. Staphylococcus aureus was the sole organism involved in all four patients who developed infection while mixed organisms i.e. Staphylococcus Aureus and E.Coli were isolated in one patient having IC5 soft tissue injury of the thigh.

Discussion:
It has been observed that monitoring and surveillance programmes are still sporadic in some European countries both in general and orthopedic surgery[10] and almost non-existent in developing countries. The infection rate varies from hospital to hospital[6]. The variation in incidence is also different because of using different criteria for comparison[1]. Some researchers use classification methods such as the classical method and simplified risk index for classification of the risk of developing wound infection and comparing results[5]. The overall rate of infection in our study was 6.4%, which is more than the acceptable range of 3-4% in most recent studies[12,13] and is even higher than the recent international studies[4]. In our country the superficial and deep wound infection in some studies is 7.8% and 10% respectively[11]. In another study it is 1.92% and 3.84%[4]. In our study the rate was 2.56% and 3.85% and is comparable to the later.

In our operation theaters instruments are placed on a large shelf after sterilization and left uncovered and trolleys are prepared from these instruments. More over untrained junior paramedical staff is also present in conventional O.Ts. While it has been observed that if instruments are covered and packed after preparation, the bacterial fall out is reduced by four fold. And if instru-

Table 1: Type of implant used

Implant	Type	No of cases
	Kuntscher nail	42
	Interlocking nail	5
Nail	Rush nail	3
	DCP	20
	JPP	20
Plate and screws	L-Plate	10

Table 2: Soft tissue injury scores

Soft tissue trauma score (Tscherne)	No. of cases treated	No. of cases infected	Percentage	Remarks
IC1	53	1	1.88%	
IC2	15	1	6.66%	
IC3	5	1	20%	4.1%
IC4	3	1	33%	
IC5	2	1	50%	40%

Table 3: Frequency of infection

Total No. of patients followed	No. of cases infected	Percentage
78	5	6.4%

ments are prepared in the ultra clean air (UCA) theater and subsequently covered, the total fall-out of bacteria on instruments is reduced 28 fold[14].

We noted in our study that condition of skin and soft tissue injury score at the time of surgery plays an important role in the development of postoperative wound infection. It was noted as shown in the Table 2 that by AO classification of the soft tissue injury, IC1 and IC2 cases had 2 superficial infections, IC3 injury had 1 deep infection and IC4 &5 had 2(40%) osteomylitis which ended up in infected nonunion and spoiled the results of surgery. Similar co-relation was observed in the study in which wounds were classified by the classical method[1,5] and also simplified risk index.[2,5]

Conclusion:

We arrived at the conclusion that Staphalococcus aureas was the commonest organism in the postoperative wound infection in our closed fractures cases managed with different types of implants. We also concluded that soft tissue injury score gives a good prediction regarding infection in clean orthopedic surgery. The more the soft tissue injury score, the more the chances of infection.

Recommendations:

As infection in orthopedic surgery is involved with great costs, so every hospital should have monitoring and surveillance programme concerning wound infection. We came to the conclusion that osteosynthetic material should be avoided in IC4 and IC5 AO closed soft tissue injury cases.

References:

1. Lidgren L, Lindberg L. Postoperative Wound Infection in Clean Orthopedic Surgery: Review of a 5-year Material. Acta Orthop. Scand. 1974; 45(2): 161-9.
2. Stevens, D. B. (1964) Postoperative Orthopedic Infection. J. Bone Jt Surg. 46-A, 96.
3. El-Adwar LI. The Infection and Role of Antibiotics in Total Hip Replacement. Egypt Orthop J. 1974; 9(4): 310-16.
4. Muhammad Shoaib Khan, Saif ur Rehman, Mian Amjad Ali, Babar Sultan, Shahid Sultan. Infection in Orthopedic Implant Surgery, its Risk Factors and Outcome. J Ayub Med Coll Abbottabad. 2008; 20(1): 23-25.
5. Silom Jamulitrat, Ubonrate Ngo, Somchit Thongpiyapoom, Porpit Varindsathien. Postoperative Wound Infection in A University Hospital. J Infect Dis Antimicrob Agents. Jan-Mar, 1989: 1-3.
6. Tscherne H, Regel R. Care of the Polytraumatized Patient. J. Bone and Joint Surg. 1996; 78B: 84-92.
7. S. Terry Canale, James H. Beaty. Campbell's Operative Orthopedics; 11th Edition. Vol.3; 2008: p-1997.
8. Ronald McRae. Practical Fracture Treatment. 3rd Edition; 1996: p-23.
9. Esterhai J, Gelb I. Orthopedic Infection. Ortho. Clin. North Am, 1991; 22: 503-10.
10. Hans Henrik Noer, Leif Pandaro Jensen, Jorgen Gottlieb, Jorn Boel, Carsten Torholm. Interest and Possibilities of Performing Post-operative Registration of Wound Infections in Danish Orthopedic Departments: A Study Survey. Int J of Clin Monitoring and Computing. 7; 21-26, 1990.
11. Jamali AR, Mehboob G, Majid A, Minhas S, Akhtar R, et al. Postoperative Wound Infection in Orthopedic surgery. J Coll physian Surg Pak 2001; 11:746-9.
12. Dhillon KS, Kok CS. The incidence of Postoperative Wound Infection in Orthopedic Surgery. Med J Malaysia. 1995; Sep: 50(3): 237-40.
13. Christina M.J.E., Vandenbroucke Grauls, Jan A Kluytmans. Prevention of Postoperative Wound Infections: To Cover Up. JSTOR: Vol.22, No.6 (Jun., 2001), pp.33-68.
14. Chosby SA, Modha D, Taylor JGS. Optimization of Ultra clean Air. J Bone and Joint Surg. 1996; 78B: 836-7.