

A Comparative study of Debridement done at Emergency Complex and Operating Room as an Initial Management of Low Velocity Gunshot Wound

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ABSTRACT

OBJECTIVES: To compare the results if debridement and delayed wound closure done at emergency complex is sufficient to the gold standard debridement procedure done at operating room as an initial management in low velocity gunshot wound.

MATERIAL AND METHOD: A retrospective study conducted at a tertiary center for which data were collected from the record

section after approval of the Chief of the medical record section. The demographic information of patients with low velocity gunshot wound were collected and reconfirmed from the orthopedic department's daily census sheet and follow-ups from outpatient department database. The charts from 2007-2010 were reviewed and data were collected.

RESULT: The majority of the patients were from age group 20-39. The average mean age is 31.11. The male numbers were higher than female i.e. 94.44% and 5.56% respectively. The femur was involved higher percentage than the tibia-fibula in the terms of gunshot wound 58.33% and 41.67% respectively. The results showed no significant difference on infection markers (White blood cell, C-reactive protein), hospital stay, fixation time with infection and infection rate. The infection rate seen was 7.32% and 6.45% respectively in the cases which were managed at emergency complex and operating room. Comparing the two procedures in terms of cost, debridement done at emergency is more cost effective.

CONCLUSION: The two procedures were comparable in terms of wound care management; infection rate, hospital stay and the cost the result also showed that debridement and delayed wound care can be done as an initial management to treat the low velocity GSW.

Key Words: Debridement; Infection rate; Low velocity gunshot wound

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INTRODUCTION

Of the estimated 1000 deaths by gunshot each day, around 250 oc-

cur in a war or armed conflict. The remainder is homicides (56%), suicides (14%) and unintentional gun deaths (5%). It was reported that 9.64-gun homicide rate per 100,000 people per year occurs in Philippines only^[1]. The gunshot related fractures are unique type of open fracture. The incidence of bullet wounds related morbidity and mortality in civilian trauma has increased in many parts of the world during the past decades, sometimes approaching epidemic level^[2]. Due to changing socioeconomic factors, increasing numbers of gunshot wounds are treated in tertiary hospitals or Urban Medical centers despite, majority of them are low velocity handgun wound, with or without resulting extremity fractures^[3].

Wartime experiences have provided the scientific basis for the proper treatment of gunshot wounds^[4,5]. There is still controversy regarding the treatment of high-velocity gunshot wounds (operative exploration, extensive primary debridement, treatment of the open wound, and intravenous administration of antibiotics)^[6,7]. However, the major controversy still remains regarding the debridement and intravenous antibiotics administration in the treatment of low velocity gunshot wounds^[8].

To our knowledge, no study has been done at the tertiary hospital comparing debridement procedure at emergency complex and operating room as an initial management of low velocity gunshot wounds. Comparison of the results were our main objectives in terms of infection rate, hospital stay and fracture fixation time.

Significance of the Study

The major significances of this study are possible reduction in cost to the patient; revising policy/protocol of hospital in managing low velocity gunshot wound; practitioners may have an alternative to the gold standard debridement procedure.

Hypothesis

There is no significant difference in the infection markers, hospital stay, fracture fixation time and infection rate between the debridement procedure done at emergency complex and operating room as an initial management of low velocity gunshot wound.

MATERIALS AND METHODS

The populations of this study are the patients of a tertiary government hospital who were admitted in the emergency department secondary to low velocity gunshot wound with extremity and bony involvement were triaged under Ortho-trauma service. The patients were evaluated by the resident on duty. The debridement was performed in the emergency department due to patients overload and no operating room slots available immediately. After letting the patient to sign consent for admission and procedure. All data collected were listed in the Daily Census Sheet of Orthopaedic Department and eventually were placed in the ortho database. For the Ethical consideration, the official letter was sent to the head of the record section and charts from 2007-2010 were retrieved for the review. The patients' profile, history, physical examination, laboratory results, progress notes, nursing notes and operative techniques were all utilized in this study. In order to eliminate the bias, the patients were assigned by their hospital number (HRN). 139 patients' sustained injury secondary to low velocity GSW but only 72 patients met the inclusion criteria and were divided into two groups, Group A (Debridement at ER complex) and Group B (Debridement at OR). The patients were being managed with standard open fracture protocol. All the patients were given TT prophylaxis at the time of admission, 1st generation cephalosporin (Cefazolin) and Aminoglycosides (Gentamycin) were started from the time of admission to minimum of 3 days. The appropriate

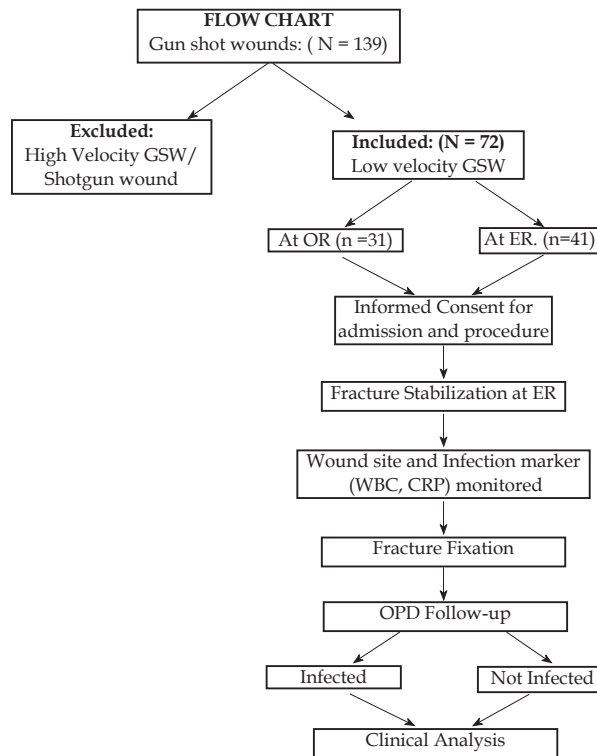


Figure 1 Algorithm of management of low velocity gunshot wound.

immobilization was done at the emergency complex. The femoral fractures were immobilized with either skin or skeletal traction while tibia fracture were immobilized with long leg circular cast (LLCC) or long leg posterior plaster splint (LLPPs). The inclusion criteria were Age group from 5 - 75 years old; low velocity gunshot injury (< 2000 ft/sec); entry point < 2 cm and exit point < 3 cm; patient visited to emergency room < 24 hours of post injury; isolated lower extremity fractures sec. to low velocity gunshot wound i.e. femur and tibia-fibula; minimum follow up for 3months and the exclusion criteria were high velocity gunshot/ shotgun injury; patient visited to ER > 24 hours of post injury; Type IIIB and Type III C open fractures; severe soft tissue damage that requires muscle flap; patients with comorbidities (e.g. DM-II); poly trauma patients including head injury.

Debridement at ER

The debridement was done at the emergency room by the resident on duty. The debridement was done under all aseptic condition under local anesthesia.

Technique of local debridement: (1) The procedure was explained to the patient and signed consent for the procedure ensues; (2) Patient placed in comfortable position; (3) The site was cleansed aseptically with povidone iodine; (4) Local infiltration with 2% lidocaine around the entry point and exit point (if present); (5) Ellipsoid incision was given at the entry point, contusion collar removed at the exit point necrotic soft tissues were removed; (6) Wound irrigation was done at the both entry and exit point with 3- 5 liter of irrigating solution; (7) No wound closure was done; (8) Sterile wound dressing done; (9) Appropriate immobilization applied; (10) Wound closure done 48-72 hours post local debridement at minor operating room.

Debridement done at Operating room

Ideally, all the patients are candidates for the gold standard debridement procedure. Signed consent were obtained prior to surgery and all the patients were scheduled as STAT case and were managed in

the operating room. Appropriate immobilization was applied. As there were no slots available in operating room, patient were only brought to the operating room within 2-4 days, till that time only wound dressing and wound monitoring were done.

Course in the ward

For the ER managed patients, the wound was being closed after 48-72 hours post debridement, once there were no signs of infection e.g. presence of swelling around the wound, erythematous wound edges, purulent discharges and necrotic tissue after wound closure. While for the formal debridement, the closure of wound was done primarily after the debridement in the operating room and the wound were being monitored for the signs of infection. For the patients with formal debridement additional 3 doses of cefazolin were given post operatively. The wound condition was monitored till the patient was discharged.

RESULTS

Out of 139 patients, only 72 patients met the inclusion criteria and they were divided into two groups, Group A and Group B. The collected data were gathered and entries were entered into Microsoft Excel Program 2007 and were analyzed using SPSS (Statistical Package for Social Sciences) software program for statistical calculation. Demographically as shown in Table 1, mean age was 31.11. The male population was dominant over female population and regarding the affected site femur was higher in ratio than the tibia.

Using the confidence level of 95% i.e. level of significance $\alpha = 1-95\% = 0.05$. So, for the p -values ≤ 0.05 ; there is no significant difference.

During the overall calculation, Table 3 shows there is statistically significant in the WBC count and WBC difference between debridement done at ER and OR while no significant difference in CRP value and Fracture fixation from time of debridement. As there is limitation in number i.e. result may differ in overall and individual statistical calculation.

Table 4 explains about the infection rate of debridement done at emergency complex and operating room which is 7.32% and 6.45% respectively. which tends to be similar.

DISCUSSION

The frequencies of gunshot wound have been increasing day by day but the mortality associated by these injuries has declined significantly. The gunshot wounds have been classified as low-velocity (< 2000 ft/s) or high-velocity (> 2000 ft/s). Orthopedic surgeons have long observed that high velocity bullets produce larger wounds and are associated with more infections than injuries caused by low velocity bullets^[9]. There are three factors to be considered in the treatment of low-velocity gunshot wounds with fracture: wound management, antibiotics therapy, and appropriate fracture treatment.

Many authors still advocate the surgical management of gunshot wounds; however, Ordog and Swan suggest that a large percentage of patients may be managed as out- patients without risk of their developing any serious complications^[10]. Morgan, Spencer, and Hershey reviewed the records of 105 patients with wounds of soft tissues injury secondary to civilian firearms and those patients were managed conservatively however antibiotics were given and there were no instances of wound infection^[11]. In our retrospective review, our all patients were given TT prophylaxis and antibiotics for minimum of three days and local debridement was done at

Table 1 Demographic Distribution.

	Demography	Debridement at ER complex	Debridement at OR	Total
Age (Mean Age = 31.11)	≤ 31	26 (63.41%)	17 (58.83%)	72
	>31	15(36.59%)	14(45.16%)	
Sex	M	39(95.12%)	29(93.55%)	72
	F	2(4.83%)	2(6.45%)	
Site	Femur	26 (63.41%)	16(51.61%)	72
	Tibia	15(36.59%)	15(48.39%)	
Age	Debridement at ER	Debridement at OT		
< 10	-	1		
10-19	10	5		
20-29	11	9		
30-39	11	7		
40-49	5	5		
50-59	2	4		
60 and above	2	-		

Table 2 Comparisons of WBC, CRP and Hospital Stay between Debridement at ER and Debridement at OR.

Parameter	Debridement	N	Mean	Z- value	df	p-value	Remark
WBC	At ER	41	13.795	-1.198	46	0.237	No significant difference
	At OT	31	14.887				
CRP	At ER	41	20.995	0.99	70	0.922	No significant difference
	At OT	31	20.745				
Hosp. Stay	At ER	41	22.415	-1.257	70	0.213	No significant difference
	At OT	31	25.065				
WBC difference	At ER.	41	13.795	2.194	70	0.032	Statistically significant
	At OT	31	14.887				

Table 3 Overall Effect of WBC, CRP, WBC difference and Fixation time on infection on Debridement done at ER and OR.

Parameter	Debridement	N	Mean	t- value	df	p-value	Remark
WBC	Infected.	5	17.58	2.194	46	0.032	Statistically Significant
	Non-Infected	67	14.018				
CRP	Infected	5	18.44	-0.534	70	0.595	No significant difference
	Non-Infected	67	21.070				
WBC difference	Infected.	5	6.86	2.088	70	0.04	Statistically significant
	Non-infected	67	3.736				
Fixation Time	Infected.	5	16.8	0.618	70	0.539	No significant difference
	Non-infected	67	14.881				

Table 4 Comparison of Infection rate between debridement procedures.

Infection rate	NO	YES	Total	Percentage of Infection
Debridement at ER	38	3	41	7.32%
Debridement at OR	29	2	31	6.45%
Total	67	5	72	

emergency room and current open fracture management protocol was followed. Most of our local debridement patients were not amenable for surgery immediately due to their financial problems; which is one of the reasons for local debridement in our hospital.

The indications for formal debridement e.g. presence of significant tissue damage, major vascular injury, progressive neurologic deficit, compartment syndrome or patient presenting 8 or more hours post-injury or unstable fractures^[12,13]. All debridement were done in operating room with current open fracture protocol management. The patients cared by debridement at ER, wound closure was done after

48-72 hours while for OR patients wound closure was done after debridement.

Proper wound care management was done in course to ward and infection was judged clinically. Beside that WBC count, ESR and C-reactive protein were also monitored for our both group of patients. As shown in Table 2, comparing those infection markers between both debridement procedures, didn't show any significant difference but only in WBC count difference. The fixation time was also being compared between two groups but it still didn't show any significance difference, one of the reasons for it could be small population size of infected patients. In comparing infection rate for both debridement procedures, the rates were nearly similar.

We would like to emphasize that our study was not able to show the data regarding the definitive management and their long term follow up as most of the patients were treated non-operatively, most of them were treated with long leg circular cast for tibia and for femur they were confined at the ward and once signs of healing seen radiographically cast brace was applied or knee hinge brace was applied. The reviewed data showed only few patients were treated with definitive management either with interlocked nailing or external fixators. Poor follow ups due to financial constraints of our patients, only few patients were included and follow up results were based on the residents note written on the charts who were assigned at the outpatient department. Overall, in debridement done at emergency complex, there was only one patient with pus discharges from the bullet entry point site and two chronic osteomyelitis were being found and in debridement done at operating room only two patients were found with draining sinus with chronic osteomyelitis.

CONCLUSION AND RECOMMENDATION

Debridement procedure done at Emergency Room and Operating Room are comparable in terms of wound care management, infection rate and hospital stays. In addition, with the current impetus toward cost containment, debridement done at ER offers major saving compared with debridement done at OR and also exposure to anesthetic hazards.

The author/s suggests Debridement done at ER, Antibiotics therapy, and appropriate fracture treatment can be done as an alternative in initial management low velocity gunshot wound. Furthermore, the authors also recommend for the prospective, randomized control trial in the comparison of debridement at ER complex Vs Operating Room, immediate or delay definitive management in the low velocity GSW in bigger population.

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