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**Evaluation of Diagnostic Value of Saline Load Test in Penetrating
Periarticular Injuries.**

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Abstract:

Background: Laceration around the joints may penetrate the synovial membrane barrier and contaminate the joint. Determining the penetration of the synovial membrane is important to the diagnosis. Saline load test has been used in the past to diagnosis penetrating joint injuries but the efficacy and safety of the test have not been determined. This study was designed to evaluate accuracy and safety of this procedure in penetrating periarticular injuries.

Material and Methods: Between April 2002 till March 2003, 100 cases of Periarticular injuries to large joints with possibility of intra articular extension were studied. Clinical examination performed to determine the possibility of penetrating into the points. Then saline load test was performed by injecting appropriate quantities of saline into the joint, depending into the size of joint, watching for extravasations of saline with joint at rest and passive motion. Two weeks later patients examined in out patient clinic for evidence of any complications related to the test .

Results: the ratio of male to female was 19:1; the mean age at the time of injury was 27.4. Eighty two percent of injuries were due to road traffic accident, the knee was involved in 68% of cases. In 47 patients saline load test was positive. In 38% of them the result of clinical examination had predicted that the joint space might not be open to exterior. In 28% of 53 patients in whom saline load test was negative clinical prediction had indicated an open joint injury. Overall, the result of saline load test had changed the treatment planned on the basis of clinical prediction in 33% of patients. There was no complication related to the procedure.

Conclusion: decision making to operate or not the basis of clinical examination is risky and can have dangerous consequences. Saline load test is a safe and reliable method for diagnosis of intraarticular penetration of penetrating lacerations.

Keywords: Saline Load Test, Penetrating, Periarticular Injuries.

Introduction

Lacerations adjacent to the joints are potentially lethal and disabling injuries.⁽¹⁾ The causes of such injuries have changed over the course of time.^(2, 3, 4) The principle of treatment of an open joint injury laid down the First World War and re-emphasized by Thompson and Berry after the Second World War and practiced widely during Vietnam War.⁽⁵⁾ In spite of changing of treatment evolving over years, one aspect of treatment has remained the same, if treatment is instituted within a few hours. There is healing without any infection, and normal movement regained despite of the immobilization.^(4, 5, 6)

Materials and Methods:

100 cases of Periarticular injuries to the large joints with possibility of intraarticular extension studied in our center over a period of one year, from April 2002 till March 2003. After clinical assessment and stabilization of patient, the wound examined carefully under aseptic conditions. The possibility of penetration into the joint is determined in clinical grounds. Saline load test then performed as follow, the hair over the area to be tapped is shaved and skin prepared with Bethadine solution. 1-2 ml of lidocain is injected under the skin and a no. 16 angiocath needle inserted into the joint cavity. We tried to use standard portals of joint tap with normal uninjured overlying skin. Then according to the size of the joint, appropriate amounts of sterile

normal saline is injected into the joint, approximately 60ml for knee, 20ml for elbow and ankle, 5ml for wrist. After injecting of saline the joint carefully examined for evidence of leakage of fluid with joint at rest and in passive motion. Leakage of saline indicates a positive test. A negative test is one during which injection of saline to the joint of increased resistance (in an unconscious patient) or to the point of the pain. After the test is performed the injected saline was aspirated. Patients who had superficial wounds, wounds that were out of the anatomical limits of joint space or wounds that were so large and extensive that articular surface was seen easily were excluded from study. Patients in whom the test was negative underwent local irrigation and wound closure. In those with positive test patients were taken to the operating room for arthrotomy, debridement, and irrigation of wound. All patients underwent Radiologic study of the involved joint. Two weeks later all patients were visited in out patient clinic for any evidence of complications related to the test.

Results:

One hundred patients with laceration around the joints were studied. The ratio of male to female was 19:1 with 95 male and 5 females. The mean age at the time of injury was 27.4 years (range 14-80 years). Majority of the injuries were caused by road traffic accidents (87%) (Table 1).

Also majority of the injuries were around the knee (68%) (Table 2). There were no cases with involvement of shoulders and hip joints.

Eighty eight percent of the patients had involvement of lower extremity large joints. Forty three percent had osseous, cartilaginous and ligamentous injuries in and around the joints, alone or in combination (Table 3).

In 47 patients saline load test was positive. In 18 of them clinical examination predicted that the joint space not be open to the exterior, indicating an error of 38% in clinical examination. In 53 patients in whom saline load test was negative, 15 patients had been judged on clinical examination, to have open joint injuries. Hence an error of 28% was noted for accuracy of clinical prediction of injury. In 33 patients (33%) the results of saline load test had changed the treatment planned on the basis of clinical examination (Table 4). There was no complication related to the procedure.

Table 1, Mechanism of Injury.

Mechanism of injury	Number (%)
Road traffic accident	87 (87%)
Gunshot	5 (5%)
Stab wound	4 (4%)
Fall from height	4 (4%)

Table 2, Joint Involvement.

Joint involvement	Number %
Knee	68 (68%)
Ankle	20 (20%)
Elbow	10 (10%)
Wrist	2 (2%)

Table 3, Associated Injuries.

Associated injuries	Number %
Fractures *	43 (43%)
Ligamentous injuries	14 (14%)
None	43 (43%)

*including osteochondral fractures

Table 4, Saline Load Test.

Saline Load Test	Clinical Prediction	% Error
Negative 53	Negative 38	28%
	Positive 15	
Positive 47	Positive 29	38%
	Negative 18	

Discussion:

Penetrating injuries of the joints are potentially dangerous and severely impair the function of joint. Prompt treatment is essential to achieved good results. On the event of infectious arthritis secondary to these injuries the treatment is both difficult and unrewarding. (4,5,6,7,and 8)

In study of Patzakis et al, the ratio of men to women was 5.3:1, with average age of 25 years.⁽⁸⁾ Perry et al, studied gunshot wounds to the knee and had male predominance of 31:1.⁽⁷⁾ In our series there were male to female ratio of 119:1, with average age of 27.4 years. It indicates the predominance of these injuries in young adult males.

Patzakis et al, studied 140 cases of open joint injuries, 59 (42%) were caused by road traffic accident and 45 (32%) were due to gunshot wounds.⁽⁸⁾ In this study 87 % of cases were due to road traffic accidents and only 5 patients had wound due to gunshot. Keeping in mind that 95% of patients were young adult male, it appeared that vehicular accidents are

still the foremost cause of injury in young adults in our country.

The knee joint has mentioned as the commonest joint involved in injuries (53 to 91%).⁽⁶⁾ in the study of Patzakis et al, 92% of injuries were involved the knee and second in order was elbow injuries with 5 cases.⁽⁸⁾ In our study 68 (68%) of patients had knee injuries and 20 (20%) of cases had ankle injuries. Occurrence of 885 of cases involving the lower extremity can probably be explained on the basis of predominant of road traffic accident. The knee with its unique architecture, is vulnerable to penetration and contamination because of its large, almost sub cutaneous area.⁽⁴⁾

Presence of osseous, cartilaginous and soft tissue injuries are detrimental to the outcome of these injuries, eighty patients (57%) in Patzakis et al, had associated fractures, they did not mention on the occurrence of ligamentous or tendinous injuries.⁽⁸⁾ In our study there were 43 (43%) fractures and 14 (14%) ligamentous injuries.

Although the saline load test has been described by Patzakis et al, there were no report regarding the efficacy and safety of the test, until Voit et al, studied the test and performed it I clinically suspicious injuries to determined the efficacy and safety of saline injection.^(8,9)

In 36 patients of Voit et al, no leakage was detected but in 14 of these, the clinical impression before test had been of damaged to the joint, an error of 39% in

clinical diagnosis.^(10, 11) in our study, of 53 patients with no extravasations of saline 15 patients were diagnosed to have open joint injury on clinical examination, there was an error of 28%. In 47 patients with leakage of saline from joint, 18 on clinical examination diagnosed to have undamaged joint, indicating an error of 38% for clinical examination. In some group in Voit et al, there was an error of 43%.^(12, 13, 14) The results of saline load test is probably most important in this group of patients, in whom if decision regarding arthrotomy is made only on clinical grounds, 38% of patients would have be denied an emergency arthrotomy and irrigation of the joint. The consequence of such a decision could have been a septic arthritis that would have been difficult to treat, and would have carried a bad prognoses. Overall in our series the results of test has changed the treatment plan in 33% of patients.

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