

Efficacy of Treatment of Septic Arthritis of the Knee in Rabbits Using Lavage Techniques

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ABSTRACT : The knee joints of eight rabbits were inoculated with a known concentration of *S. aureus*. The rabbits were monitored for signs of septic arthritis. On the third day after clinical onset of infection, the rabbits underwent surgery. Arthrotomy with irrigation was done for the right knees and closed lavage procedures were done for the left knees. Synovial tissues were obtained after each procedure and submitted for bacteriologic studies in the form of bacterial colony count. The results for the two different forms of treatment showed no difference in bacterial growth post operatively. Arthroscopic lavage as a form of treatment of septic arthritis of the knee is therefore being recommended for early phases of the disease.

INTRODUCTION

The treatment of septic arthritis continues to be controversial, range from repeated aspirations to formal arthrotomy. A new form of treatment has been introduced recently in the form of joint lavage through arthroscopic portals. The results have been encouraging as compared to repeat aspiration which is associated with a high degree of failure in treatment and arthrotomy which is associated with a lot of post-operative morbidity. This study aimed to duplicate the results of arthroscopic lavage in rabbit models. The technique of irrigation in arthroscopic lavage will be compared to the irrigation done in arthrotomy and the results will be based on the amount of bacterial colonies presented at the end of each procedure.

MATERIALS AND METHODS

Eight rabbits were labeled and baseline weight was taken (Table 1). Rectal temperatures were taken every eight hours. After three days had elapsed to allow the rabbits to

acclimatize with their surroundings, both knees were inoculated with 0.1-0.2ml. of a solution containing 10 organisms of *S. aureus* per ml. Temperature rises were noted and the general activity was observed.

On the third day after clinical onset of infection which was generally heralded by temperature rise, the rabbits underwent surgery. The right knees were anesthetized by local infiltration of 2% Xylocaine and arthrotomy was done using a medial parapatellar incision. At the end of washing, synovial tissue specimens were obtained for bacteriologic studies and the knee joints were closed. The left knees are likewise anesthetized and subjected to closed lavage procedures. A G.23 butterfly needle was inserted into the joint lateral to the patella and used as an ingress tube. A larger bore G.19 butterfly needle was used as an egress tube. Two hundred ml. of normal saline was delivered under pressure into the joint using a 20 ml. syringe and suction drainage was achieved by creating a negative pressure with an equally large syringe. At the end of the procedure, a formal arthrotomy was done and synovial tissue was obtained for bacteriologic studies.

RESULTS

All the rabbits showed an increase from the baseline temperature of 1-2 degrees centigrade as early as the first day post-inoculation. The animals showed a concurrent decrease in appetite and were generally lethargic. Their appetite and activity gradually returned to normal levels with the lysing of the fever which generally occurred on the third to fourth day. Intraoperatively, all the knees were found to contain turbid synovial fluid and very thickened synovial tissue. Some knees were more affected than others and had a greater quantity of detritus within the joint cavity on arthrotomy. Detritus was also noted to drain from the egress needles and arthrotomy

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after closed lavaging did not yield any residual debris. Bacteriologic examination of the specimen was done in two batches. The first batch was composed of synovial tissue specimens from rabbits 1-4. The tissues were weighed and diluted and were smeared onto a glass slide and colony counts were made. No colonies were seen on microscopic examination in all specimens submitted. A part of the specimen from each of the next batch of knees (rabbits 5-6) was placed in an enrichment medium of fluid thioglycollate to see if any bacteria can be cultured from the specimen. The results of the colony count was subjected to statistical analysis using the T-test which show that there was no significant difference between the two modes of treatment (0.01 level of significance).

DISCUSSION

Previous studies have shown that the most affected joint is the knee and the most common organisms are *S. aureus* and *Streptococci*¹. Mixed infections are seen in immunocompromised patients and the presence of foreign bodies also predispose to the development of infection^{2,3,4,5}. The indications for surgical drainage are the presence of large amounts of fibrin, tissue debris and loculation which prevent adequate drainage by simple needle aspiration. Arthroscopic debridement is recommended within the first 36-72 hours from the onset of the disease when the infection is primarily synovial in origin. Any delay in treatment will produce fibrinous loculations and a progressive increase in the dead space, synovitis and fibrin formation which limit the effectiveness of parenteral antibiotics. Also, these factors contribute to decrease visualization and arthroscopic maneuverability.

Compared to needle aspiration or irrigation alone, arthroscopic evacuation of septic joints provides significant joint distention and copious lavage. The advantages of arthroscopic lavage over needle aspiration is that it can achieve removal of foreign bodies, debridement of fibrinous areas, partial synovectomy and visual documentation of the state of articular content². In addition, it can be used to lyse adhesions, drain loculations and place irrigation catheters⁶, antibiotics are also enhanced.

This study had compared two modes of treatment of septic arthritis of the knee in rabbit models. No difference was noted in the post lavage bacterial colony count in knees treated by arthrotomy and lavage and those treated by "arthroscopic" lavage. Although not all specimen samples were placed in an enrichment medium, there was strong evidence of a pre-existing infection of the knee joint prior to the operation. However, the growth of the bacteria only in the presence of an enrichment medium and after 48-72 hours did not mean that the debridement was inadequate. Rather, the presence of only a single colony of bacteria theoretically can grow in an enrichment medium. It is hoped that eventually, this new form of treatment for septic arthritis will be used routinely in humans. The results are encouraging as shown by other studies as well^{7,8}. The procedure is relatively simple and provides a middle path which combines the advantages of not opening up the capsule as advocated by proponents of the aspiration technique and of having a thorough debridement as advocated by proponents of the arthrotomy technique. In the local setting, this form of "arthroscopic" lavage may be done without an actual arthroscope. This study has shown that the lavage of the knee joint using cannulae inserted through the normal arthroscopic portals can effectively clean the joint cavity if done during the synovitis stage of the disease. No arthroscopic maneuvers were done and the end results were the same.

Although the study shows a statistical significance, the sample size is relatively small. Also, the presence of infection should have been documented by Gram stain and cultures before the procedures were begun.

TABLE I
WEIGHT OF RABBITS

RABBIT #	WEIGHT IN GMs.
1	900
2	920
3	1,400
4	700
5	890
6	810
7	850
8	790

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