Arthroscopic Debridement with Ingress Egress Drain in Treatment of Septic Arthritis

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Statement of Purpose

Septic arthritis is an acute emergency with a complex diagnosis due to variation within the literature regarding synovial fluid analysis diagnostic markers. Emergent surgical arthroscopic lavage is often indicated in the clinical suspicion of septic arthritis with significant intraoperative findings such as extensive purulence warranting multiple arthroscopic lavage. This case study presents our protocol for the treatment of acute septic arthritis with arthroscopic lavage and ingress egress drain placement for continuous lactated ringer lavage over a twenty four hour period.

Literature Review

Septic arthritis is a challenging diagnosis with the literature providing generalized guidelines for normal values of synovial fluid analysis.[1] However, literature also suggests most synovial fluid analysis (SFA) values remain non-diagnostic.[2] Many have considered a positive gram stain diagnostic, however this is reported as only having a sensitivity of 29-50%.[2] In addition, increased nucleated cell counts greater than 2000, or peripheral blood mononuclear cells (PMNC) greater than 75% are more likely indicators of an inflammatory arthritis.[2] The considered standard for septic arthritis diagnosis compared to other inflammatory pathologies is the white blood cell count (WBC) greater than 50,000, however synovial fluid analysis is often not this explicit and a white blood cell count greater than 100,000 is a better positive predictive value.[2] While a culture is a more definitive diagnosis, this may take days to return and can result with a false negative.[3,4] An additional laboratory marker is the synovial fluid analysis glucose compared to serum glucose levels drawn immediately before or after the synovial fluid analysis ankle aspiration. The synovial fluid analysis glucose level should be near 10mg/dL less than the serum glucose. While this is not diagnostic, it may be a useful addition for determining septic arthritis in a potentially difficult clinical presentation.[5,6] Additionally, a 16s ribosomal probe can be completed via PCR analysis to detect specific bacterial DNA even if cultures are returned negative.[7] This may be particularly important in immunocompromised patients who may present with an atypical infection.[8] While these indicators all offer suggestions of septic arthritis, clinical decision making is key.

Case Study

A case is presented of a 65 year-old diabetic male with significant medical history for alcoholism, hypertension, hyperlipidemia, and retained hardware to the affected limb secondary to a previous pilon fracture. The patient presented with increased erythema, edema, and pain with range of motion to the right ankle (Figure 1). Radiographic studies demonstrated chronic destructive changes of unknown etiology with consideration for Charcot versus osteomyelitis (Figure 2). Laboratory studies demonstrated the following: white blood cell count 16.8, C-reactive protein 33.9, and erythrocyte sedimentation rate 56. An ankle joint aspiration was performed with SFA demonstrating crystal gout uric acid, increased nucleated cells, and increased peripheral blood mononuclear cells (Figure 3, Table 1). SFA demonstrated low glucose compared to serum levels (Table 1). Pre-operative planning was made for emergent arthroscopic lavage with bone biopsy. Intraoperatively standard anteromedial and anterolateral arthroscopic incisions were made. Upon incision of the ankle joint capsule gross purulence was noted. Pulsatile lavage was used to wash out the ankle joint. Further intraoperative dissection was taken distal to the talonavicular and midfoot joints where significant purulence was noted indicating that all midfoot joints were likely additionally septic. Intraoperatively the talus and the tibia were noted to be soft and bone biopsies were taken. Arthroscopy tubing was placed into the anteromedial arthroscopic incision and sutured in place for the ingress drain (Figure 4). Additional tubing was placed into the ankle joint posterolateral and sutured in place for the egress drain (Figure 5). Lactated ring solution bolus was attached medially and gravity lavage was performed. At alternating hours the egress drain was clamped open and closed to allow the ankle joint capsule to distend to obtain complete lavage (Figure 6, 7). SFA later demonstrated beta hemolytic streptococcus group B on the culture/gram stain and a 16s ribosomal probe study demonstrates strep agalactiae. Intraoperative bone biopsy demonstrated osteomyelitis and postoperatively patient was given the choice for limb salvage or below knee amputation. Patient elected to proceed with below knee amputation.

Figure 1: Clinical presentation

Figure 2: Pre-operative X-ray

Figure 3: Pre-operative

	Normal	Case Study
Color	Clear, straw	Cloudy
Crystals	Negative	Positive
Gram Stain/Culture	Negative	Beta Hemolytic Strep Group B
PMNCs	0-25%	93%
Lymphocytes	0-100%	7%
Nucleated Cells	0-300.0 mcL	254,700.0
Glucose	Within 10mg/dL of serum	SFA 6, Serum 106

Table 1: Synovial fluid analysis values normal compared to case study [1]

Figure 4: Medial ingress drain

Figure 5: Lateral egress drain

Figure 6: Completed ingress egress drain intraoperatively

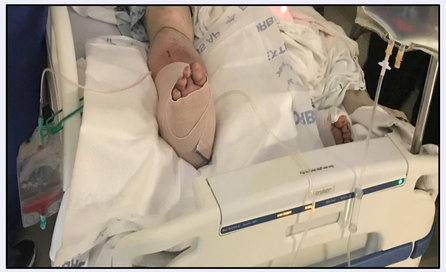

Figure 7: Completed ingress egress drain inpatient with lactated ringer lavage

Literature Review

While arthroscopic treatment is indicated in patients of septic arthritis, some literature has questioned the efficacy of arthroscopic treatment and more particularly the efficacy of a single arthroscopic lavage.[9] Aim et al. analyzed 46 cases of septic arthritis in various joints, all patients received an arthroscopic joint lavage and dual antibiotic therapy. Within the study 25% patient required more than one arthroscopic lavage with 93% demonstrating full recovery. Prognostic factors for failure to clear infection included a Gatcher stage of III or IV and positive cultures at 24 hours.[9] Variation in protocol-directed arthroscopic treatment has been demonstrated in septic arthritis of the ankle, as well as differences in the reported number of arthroscopic lavage required.[10,11] The use of an ingress egress drains offers the opportunity to provide continuous lavage for a 24 hour period with a single operation for arthroscopic lavage as this case study presents.

Analysis & Discussion

This study presents an evident clinical and laboratory presentation of acute septic arthritis. The synovial fluid analysis included comparison with serum glucose without awaiting positive culture in the clinical setting to proceed with arthroscopic lavage. Alternative techniques are important to consider for septic arthritis of the ankle joint without definitive protocols determined for arthroscopic lavage in the literature.[10,11] In this case study, an ingress egress drain was placed intraoperatively with continuous lactated ringer flush for 24 hours to reduce bacterial load. With hourly alternation of opening and closing of the egress drain and a continuous ingress drain, lactated ringer is allowed to fill the capsule and provide ankle joint capsule distension. This allows for significant lavage of the ankle joint to eradicate infection. The case provides an ingress egress drain as a viable treatment option for extended arthroscopic lavage in cases of severe infection.

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