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Long-term outcomes after infected mini-open rotator cuff repair: results of a 10-year review

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Background: Infection after rotator cuff repair (RCR) is uncommon. There are few reports in the literature regarding the management and long-term results of patients in whom deep infection of the shoulder develops after RCR. The objective of this study was to assess the long-term clinical and radiologic outcomes of these patients.

Methods: We retrospectively reviewed a consecutive series of 764 patients after mini-open RCR in which 9 patients had postoperative infection. The demographic data, clinical and laboratory findings, risk factors, bacteriologic findings, and results of surgical management were analyzed. All patients underwent clinical and radiologic assessment at long-term follow-up of approximately 10 years after infection.

Results: The mean age of the patients was 56.2 years. The mean time to presentation for infection after RCR was 16 days. All patients had pain on presentation, and 6 patients had persistent discharge from their wounds with erythema. The most common organism was *Staphylococcus aureus*. At final follow-up at a mean of 11.62 years after surgery, the mean Simple Shoulder Test score was 10.5 and the mean Constant score was 70. The rotator cuff was intact in 5 of 7 patients.

Conclusion: With appropriate treatment, eradication of infection can be achieved, and in appropriate cases, anchors can be retained. Reasonable long-term functional outcome scores can be achieved.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Rotator cuff repair; mini-open; infection; outcomes; review; long-term results; management

Rotator cuff tear is a common pathologic process, and surgery may be indicated if it is symptomatic.[15] Infection after rotator cuff repair (RCR) is uncommon; reported rates range from 0.27% to 1.7%, with a rate of 1.9% for mini-open repairs.[5,10,12,16] Infection is most often acute, and diagnosis may be difficult with indolent organisms. Hematogenous seeding to the shoulder is possible and may result in recurrent infection, the source of which may be difficult to identify.[3]

There are few reports in the literature regarding the management and long-term results of patients in whom deep infection of the shoulder develops after RCR. In this retrospective review, we analyzed the demographic data, clinical and laboratory findings, risk factors, bacteriologic findings, and results of surgical management of patients presenting with deep infection after RCR surgery.

Clinical and radiologic outcome measures were used to assess the long-term results of these patients, with long-term follow-up review being performed at 10 years after surgery.

The Barwon Health Research Ethics, Governance & Integrity (REGI) Unit has exempted this study from review: reference No. 16/43.

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Methods

Patient population

Between November 2002 and August 2006, a total of 764 patients underwent RCR surgery across a combination of 4 public and private hospitals in our regional area. Of the 764 patients, 9 patients in this retrospective case series were identified in whom a postoperative infection developed. The overall incidence of infection was 1.2%.

Deep surgical site infection was defined by the Centers for Disease Control and Prevention guidelines.[9] Infection was diagnosed when at least 1 of the following criteria were met:

1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.
2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least 1 of the following signs or symptoms: fever (>38°C), localized pain, or tenderness, unless site is culture negative.
3. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
4. Diagnosis of a deep incisional surgical site infection by a surgeon or attending physician.

Primary surgical procedures

All patients had an arthroscopic evaluation of the shoulder and subacromial decompression at the index operation before RCR. Five patients then underwent a mini-open repair of the rotator cuff; 4 patients had an open repair.

Method of outcome evaluation

Patients were followed up at a mean of 11.62 years after surgery (range, 10-13.75 years). No patients were lost to follow-up. Functional outcome measures assessed included the Simple Shoulder Test (SST) and Constant score.[6] Radiologic outcomes were assessed by radiographic examination in 9 of 9 patients and magnetic resonance imaging (MRI) in 7 of 9 patients.

Results

Patient demographics

All 9 patients who had a postoperative infection were male. The mean age was 56.2 years (range, 43-67 years) (Table I). One case was compensable under workers' compensation.

Risk factors

Associated medical illnesses were uncommon. One patient had a history of ischemic heart disease. No patients were diabetic or immunosuppressed, and none were smokers. There were no local predisposing factors, such as previous wounds or prior shoulder surgery. Two patients had subacromial cortisone injections administered 4 months and 1 year before surgery.

Table I Demographics of the patients and clinical findings

Characteristic	Data
Age (y)	56.2 (43-67)
Gender, men/women	9/0
Comorbidities	
None	8
Diabetes	0
Smoker	0
Prior surgery	0
Prior injection	2
Time to infection (d)	16 (4-36)
Symptoms on presentation	
Pain	9
Erythema	8
Drainage	6
Systemic (fever, chills, malaise)	3
White blood cell count ($\times 10^9$/L)	8.47 (5.8-10.8)
Erythrocyte sedimentation rate (mm/h)	71.8
C-reactive protein level (mg/dL)	137 (27-270)

Tear size

The tear size in the supraspinatus was documented at the time of surgery in 6 of the 9 patients. They were all 3- to 4-cm large tears (Table II).

Clinical and laboratory findings

The mean time to presentation of the patient with infection was 16 days (range, 4-36 days). All but 1 presented within 3 weeks, and all had increasing pain. Six patients had persistent discharge from erythematous wounds. One patient presented late (36 days) with increasing pain. White blood cell counts were available in 7 patients; the mean was 8.47 $\times 10^9$/L (range, 5.8-10.8 $\times 10^9$/L). The C-reactive protein level was available in 8 patients; the mean C-reactive protein level was 137 mg/L (range, 27-270 mg/L). The erythrocyte sedimentation rate was available in 6 patients; the mean erythrocyte sedimentation rate was 71.8 mm/h (range, 16-113 mm/h).

Treatment

Seven patients had surgical washout and débridement performed within 1 day of presentation. One patient had surgery 2 days later. He presented initially to his general practitioner, who attempted empirical antibiotic treatment in a peripheral hospital.

The remaining patient had surgery 7 days after presentation. He presented to his general practitioner with pain but was not systemically unwell. An initial shoulder aspirate did not reveal micro-organisms. However, his symptoms worsened, and a washout was performed.