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Indolent and delayed presentation of *Pseudomonas aeruginosa* infection of the shoulder joint after arthroscopic Bankart repair and remplissage surgery: A case report

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Abstract

Case report: 54-year gentleman who underwent arthroscopic Bankart repair with remplissage presented after 1 month with non-purulent swelling of the posterolateral arthroscopic portal site. Blood and MRI studies suggested the presence of infection which was immediately treated with arthroscopic joint lavage, synovectomy and antibiotic monotherapy for 6 weeks. Culture revealed *Pseudomonas aeruginosa*. At 1 year follow-up, the patient was free of infection with full recovery of shoulder movements.

Conclusion: *Pseudomonas aeruginosa* is a frequent cause of hospital-acquired infection. Indolent and delayed presentation after arthroscopic shoulder surgery is rare. Early detection and treatment on an emergency basis improve the recovery of the patient with preserved shoulder function.

Keywords: Suture anchor, infection, bankart repair, non-purulent swelling, elevated CRP, *P. aeruginosa*, Nosocomial

Introduction

Arthroscopic bankart's repair with remplissage procedure is the most common procedure for anterior glenohumeral instability without significant glenoid bone loss [1]. Arthroscopic bankart's repair with remplissage is a relatively safe procedure and complication rates as described in the literature are 0-2.3% [2]. Complications include transient neuropraxia, adhesive capsulitis, infection and recurrent instability [2]. Infections following arthroscopic shoulder surgeries are as low as 0.3% [3, 4]. Arthroscopic rotator cuff repairs have increased incidence of infection with high risk in patients older than 60 years and previous surgeries in the same shoulder [5, 6]. The most common organisms isolated after shoulder arthroscopic surgeries are Staphylococcus epidermidis, followed by Propionibacterium acnes and Staphylococcus aureus [7, 8]. Other organisms causing infections are *Pseudomonas aeruginosa*, Mycobacterium tuberculosis, Actinomyces species [7, 9, 10]. *P. aeruginosa* infections following arthroscopic shoulder surgeries are rare and are difficult to treat due to the natural antibiotic resistance for antibiotics and the ability to develop further resistance during the treatment course [11]. *P. aeruginosa* had a higher rate of recurrence when compared to S.aureus associated osteomyelitis [12]. We present a case report of delayed post-operative infection at 4 weeks by *P. aeruginosa* following arthroscopic bankart's repair with remplissage and successfully treating the infection with good functional results at 1 year follow up.

Statement of Informed Consent

Informed surgery consent was obtained and the patient was informed that data concerning the case would be submitted for publication and patient agreed.

Case report

A 54-year-old gentleman presented to us with pain over his left shoulder following a fall on his shoulder and persistent difficulty in lifting the shoulder.

On clinical examination, the patient had a positive apprehension test suggesting instability and associated painful shoulder movements. MRI study revealed bony bankart's lesion with engaging hill sach lesion. He was treated with arthroscopic bankart repair with remplissage. Immediate postoperative was uneventful and sutures were removed at end of 2nd week. He was encouraged passive mobilisation of shoulder and isometric strengthening exercises after suture removal. At the end of the 4th week, the patient developed red, non-tender swelling at the posterolateral portal site (Fig 1). There was no discharge from the sinus and also absent constitutional symptoms and local signs of inflammation. Passive shoulder movements were painless, blood investigations showed WBC (9800 cu/cc.mm), ESR (66 mm), CRP 242 mg/L. MRI of the left shoulder showed a high intense signal around the remplissage triple loaded anchor site (Fig 2 and Fig 3) with associated fluid in the joint extending from remplissage anchor to subacromial space.

Given blood reports and MRI findings, infection was suspected and the patient was taken up arthroscopic debridement and lavage of the glenohumeral joint and subacromial space and removal of infected PEEK anchor by the senior author who performed the index surgery. Intraoperative findings include inflamed synovium, 10ml serous secretion in the joint, loose PEEK anchor at remplissage site, intact bankart's repair. Secretions, tissue samples and anchor were sent for culture and sensitivity. Empirical antibiotic therapy with Inj. Cefuroxime 1.5gm intravenous was given twice a day in the postoperative period till the culture report was available. Culture reports showed *P. aeruginosa* species and organism-specific antibiotics. Oral Ciprofloxacin 500mg twice a day for 6 weeks was advised by an infectious disease specialist as it was the most sensitive antibiotic. We followed up the patient with serial WBC cell counts, ESR and CRP at serial intervals and radiographs of the shoulder joint (Table 1).



Fig 1: Posterolateral portal showing localised non purulent swelling



Fig 2: MRI Axial section – Signal changes at posterior shoulder extending from subcutaneous plane to remplissage anchor

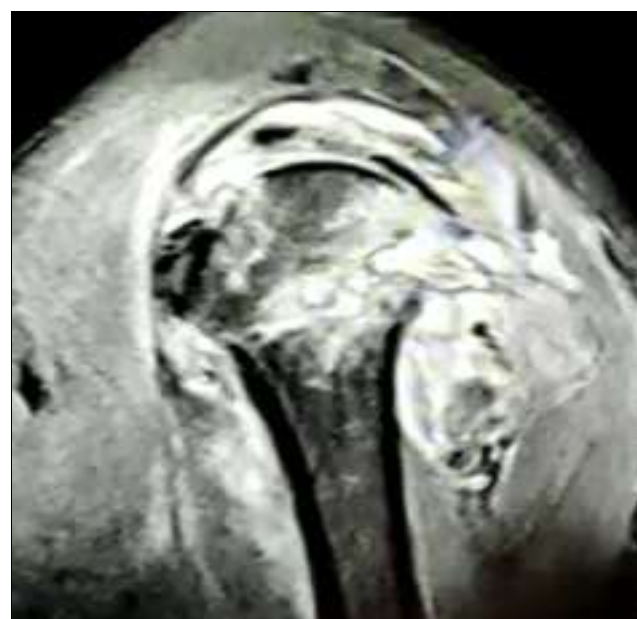


Fig 3: MRI Sagittal section showing the sinus

Table 1: Values of the post-surgery laboratory tests of WBC count, ESR and CRP

Follow Up	WBC count cc/cu.mm	ESR (mm)	CRP (mg/L)
At time of presentation	9800	66	242
1 month	8600	22	6.41
2 months	8500	13	3.31
3 months	8400	6	1.5
12 months	8000	3	1.46

Outcome

At the end of 2nd week, the surgical site was healing well without any local signs of infection. Suture sites healed well at the end of 4 weeks (Fig 4). Passive mobilisation of the shoulder was initiated after 4 weeks and active mobilisation and strengthening were started after 6 weeks. With further rehabilitation, the patient achieved a full range of movement and power at the end of 3 months post-surgery. The patient was followed up till the end of one year and had a full range of movements (Fig 8-11) with healed arthroscopic portal sites and no signs of instability (Fig 5 and 6). Radiographs at end of 1 year showed some irregularity of humeral head with no signs of infection (Fig 7) which was left unaddressed as the patient was symptom-free.



Fig 4: One month follow up



Fig 5, 6: 12 months follow up



Fig 7: Final radiograph at the end of 12 months



Fig 8-11: Final shoulder ROM at the end of 12 months

Discussion

Infection rates after primary arthroscopic shoulder surgery are as low as 0.3% [4] and around 2.1% in revision rotator cuff repairs [5]. *Pseudomonas aeruginosa* is an opportunistic gram-negative bacterium, notorious for causing multidrug-resistant hospital-acquired infections. Adaptation mechanisms like quorum sensing (QS), motility-sessility switch, biofilm formation, antibiotic resistance mechanisms, adaptive radiation for persistence, stringent response and persists, and the CRISPR-Cas system makes it very difficult to eradicate [13]. The biofilm formation is of particular importance as it enables the bacteria to persist on any plastic or metal surface [14]. The incidence of infection due to *Pseudomonas aeruginosa* in arthroscopic shoulder surgeries are rare, though it accounts for 5-20% of gram-negative bacterium causing Prosthetic joint infections [15]. Risk factors for infection with *Pseudomonas* species following arthroscopic shoulder surgeries are revision surgery, obesity, male sex, chronic anaemia, malnutrition, depression, alcohol use, previous intraarticular steroid use [16]. Another possible risk factor for *P. aeruginosa* causing infection after arthroscopic shoulder surgeries are due to contaminated arthroscopic instruments [17]. When infection of a joint is suspected and confirmed, treatment should be started without delay. Joint aspiration helps in confirmation of infection when in doubt [3]. Low-grade non-purulent infection was reported after shoulder surgeries and joint aspiration and monitoring the culture for at least 10 days before reporting negative is ideal due to the slow-growing nature of pathogens in these cases [18]. Treatment on an emergency basis can improve the chances of recovery and multiapproach treatment is preferred. Arthroscopic joint lavage is a more appropriate option than open lavage. Synovectomy is combined with joint lavage and extensive synovectomy is advised to reduce the bacterial load [3]. In a study by Pliska, the efficacy of different antibiotic groups against *P. aeruginosa* was compared and found out isolates were most sensitive to doripenem (97.4±1.8%), aminoglycosides (gentamicin and amikacin 94.8-96.1%) and fluoroquinolones (ciprofloxacin and levofloxacin 74-80.5%). He also identified an increasing trend of resistance against sensitive antibiotics [19]. Grillon *et al.* compared the effectiveness of fluoroquinolones against *P. aeruginosa* and found that Levofloxacin has more bactericidal activity than ciprofloxacin [20] and also chances of developing resistant mutants were less with levofloxacin [21]. They also stressed the factor of particular strains is more sensitive to ciprofloxacin than Levofloxacin. Earlier recommendations of multidrug therapy for pseudomonas infection was contradicted by Laghrouche *et al.*, they recommended antibiotic therapy with a single sensitive antibiotic for a duration of fewer than 6 weeks together with another antipseudomonal antibiotic for initial 5 days [22]. We followed the recommendations of the infectious disease society of America of continuing antibiotics for at least 4-6 weeks of organism-specific intravenous or oral antibacterial therapy with high bioavailability [23]. Panella *et al.*, described a similar case of *P. aeruginosa* related infection after arthroscopic assisted latissimus dorsi transfer for rotator cuff tear and successful treatment with combined arthroscopic lavage, debridement and antibiotic therapy [24]. Compared with their study, our case report is *P. aeruginosa* infection following complete arthroscopic procedure which is rarely described. We were not able to zoom on the reason for infection with *P. aeruginosa* after shoulder surgery as our patient was not having any of the risk factors for infection and an infection

audit of the hospital showed that there were no cases of pseudomonas post-operative infection in the hospital, 2 weeks prior and 2 weeks post the index surgery [17]. It was interesting to note that the operation theatre was non-functional for the last 6 months due to the covid pandemic and the above-described case was the first arthroscopic surgery performed after the pandemic. Bacterial swabs from the operation theatre before reopening didn't yield any results. We concluded that the source of infection may be hospital-acquired as the pathogen is one of the most common causes of nosocomial infection [25]. The delayed and indolent presentation of the pathogen in our case was surprising.

Conclusion

Although rare, *Pseudomonas* associated infections after arthroscopic shoulder surgery are reported in the literature. *Pseudomonas* is one the most common cause of hospital-acquired infection. Presentation following infection can be variable from low-grade shoulder pain to painless non-purulent swelling of the surgical site to full-blown septic arthritis with purulent discharge. When in doubt of infection, joint aspiration and culture analysis is helpful in confirmation. In our case, we were able to successfully eradicate the infection by thorough joint lavage, debridement and antibiotic monotherapy for 6 weeks. Earlier detection of infection and treatment on an emergency basis improves the recovery chances and in preserving the joint function.

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