

Non-tuberculous Mycobacterial Infection (*Mycobacterium Abscessus*) after Anterior Cruciate Ligament Reconstruction: A case report

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Infection after anterior cruciate ligament (ACL) reconstruction is an uncommon condition. We report a case of non-tuberculous infection (Mycobacterium Abscessus) after ACL reconstruction with an autologous quadruple hamstring graft and fixation with a bioabsorbable interference screw. One year after arthroscopic ACL reconstruction surgery, the patient presented with a painless posterolateral mass of the knee. The patient underwent open debridement of the abscess at the posterolateral aspect of the knee. The tissue culture after 6 weeks from the first surgery was positive for Mycobacterium abscessus, proper antibiotic treatment was given by the infectious specialist. Abscess and drainage recurred 3 months after first debridement, another open debridement was done and antibiotic was given for another three months. At the last follow up at King Chulalongkorn Memorial hospital, the wound was closed and the patient was symptom free. To our knowledge, this is the first preliminary case report of a non-tuberculous (M. abscessus) infection after ACL reconstruction.

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Introduction

Arthroscopic anterior cruciate ligament (ACL) reconstruction is a standard treatment for ACL injuries in athletes with an excellent outcome. The ACL reconstruction can increase stability of the knee joint which helps the patients and athletes return to previous sports activity levels and improve the quality of life. There were reports of some complications after ACL reconstruction, such as infection and septic arthritis^(1,2). The treatment of the infection after ACL reconstruction depended on the severity of the infection, type of organism, underlying disorders, and comorbidity of the patients.

Generally, the initial treatments are open arthrotomy or arthroscopic debridement of the knee joint. Open drainage of the abscess, removal of the instrument fixation of the graft or removal of the ACL graft may also be performed with antibiotics therapy.

There was a retrospective analysis of tubercular infections after arthroscopic ACL reconstruction, which reported an infection rate of 0.69% (8 from 1,152 cases). The diagnosis were performed by positive synovial tissue cultures (3 patients), positive for characteristic histopathology (7 patients), and positive for polymerase chain reaction (PCR) (6 patients)⁽³⁾. A non-tuberculous mycobacterial infection is a rare condition after reconstructive surgery. There were sporadic reports

of *Mycobacterium fortuitum* infections that produced non-healing discharge sinus tracts from the tibia⁽⁴⁾ and *Mycobacterium farcinogenes* infections after total hip arthroplasty⁽⁵⁾. *Mycobacterium Abscessus* infections were previously reported after soft tissue augmentation around the cheek and jaw from plastic surgery (a case report⁽⁶⁾, 0.33% of 5,200 patients), after lung transplantation⁽⁷⁾, and after breast augmentation (a case report)⁽⁸⁾.

There were a number of studies about *M. Abscessus* infections after orthopaedic surgery. An *M. Abscessus* infection after prosthetic joint (total hip arthroplasty) surgery was treated by irrigation and debridement of the hip joint, the prosthesis removed and replaced with a cement spacer. The study also reported the failure of standard first line antibiotics therapy and the success of Tigecycline combination therapy⁽⁹⁾.

To our knowledge, our report is the first case report about a *Mycobacterium Abscessus* infection after ACL reconstruction (using the quadruple hamstring autograft; semitendinosus and Gracilis grafts).

Case Report

A 21-year-old man presented at the orthopaedics clinic at King Chulalongkorn Memorial hospital with a history of twist injury on the right knee after playing soccer (July 12th, 2010). He had pain, swelling, and was unable to bear weight on the right knee. Plain radiography of the right knee showed no demonstrable fracture, subluxation, or dislocation of the right knee. His

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knee was immobilized with a posterior slab for 3 weeks followed by a home physiotherapy program. One year after the first injury, the clinical symptoms of pain and swelling had improved, but he still had instability with pain when participating sports activities or running. Physical examination of the right knee showed a positive anterior drawer test, positive Lachman test, and a positive pivot shift test. MRI revealed a complete tear of the ACL and a horizontal tear of the posterior horn of medial meniscus. The patient was scheduled for an arthroscopic ACL reconstruction operation on November 5th, 2012 using a hamstring (semitendinosus and gracilis) autograft. The operation was done by arthroscopic transtibial femoral tunnel drilling and the graft was fixed with a bioabsorbable interference screws (Arthrex; Poly-L-lactic acid or PLLA screw) on both the femoral and tibial ends. The medial meniscal was repaired by using an all-insided meniscal repair (Arthrex; Meniscal cinch-Low profile PEEK with pretied 2-0 fiberwire).

One year after index surgery, the patient came to the orthopaedic clinic with the complaint of a palpable mass and progressive swelling on the posterolateral aspect of the knee for two months without a history of pain, fever, or drainage. Physical examination showed a painless mass sized 5x5 cm² in diameter, mild redness, and a rubbery consistency at the posterolateral aspect of the right knee (Fig. 1). The right knee had no swelling, no effusion, and no anterograde-posterior laxity.

No pus or discharge was found by needle aspiration of the mass. A plain film of the right knee showed both tibial and femoral tunnel widening (Fig. 2). A magnetic resonance imaging (MRI) of the right knee revealed a high signal intensity mass on the posterolateral aspect of the knee which went deep into the popliteal fossa and connected with a high signal intensity tissue around the bioabsorbable screw in the femoral tunnel. (Fig. 3)

Laboratory studies before the operation were done and showed a normal erythrocytes sedimentation rate (erythrocyte sedimentation rate=12 mm/hr) and a normal C-reactive protein level (C-reactive protein < 3.19). Arthroscopic examination of the right knee was done and followed by open drainage of the wound (posterolateral knee) on November 8th, 2012. The arthroscopic finding revealed an intact ACL graft with some soft tissue adhesion around the intercondylar notch area. Arthroscopic debridement of the adhesion was done, no synovial inflammation or frank pus was found within the knee joint (Fig. 4). The intra-articular synovial fluid was sent for Gram's staining and culture. After a skin incision was created at the mass, a moderate amount of whitish debris tissue was found around the mass and the tract was extended to the lateral cortex of the distal femur, no frank

pus was found (Fig. 5). Debridement was performed with a curettage and irrigation of the mass by normal saline solution (NSS:H₂O₂ (1:1) and NSS:Povidine (1:1)). A penrose drain was inserted and the wound was left open. Tissues from the mass were sent for tissue culture (aerobic, anaerobic, *M. Tuberculosis*, and fungus), PCR for tuberculosis (TB), and also tissue histopathology. The empirical intravenous antibiotics included Cefazolin, 1 g every 6 hours, and Gentamicin, 240 mg for 7 days then switch to oral antibiotics which included Dicloxacillin 2 g a day.

One week after surgery, the penrose drain was removed and wound dressing was continued everyday. At the first 2 weeks, granulation tissue had grown and covered the bare area. The previous synovial fluid Gram's staining and culture were negative from the knee joint. The previous laboratory results were negative for tissue aerobic culture, tissue anaerobic culture, tissue fungus culture, and tissue PCR for TB. The pathological report of the microscopic examination showed necrotic tissue surrounded by numerous histiocytes and numerous neutrophils, mixed with multinucleated giant cells; the remaining stroma consisted of lymphocytes and histiocytes. The pathological diagnosis was acute necrotizing granulomatous inflammation. We waited for the result of the tissue culture for *M. Tuberculosis* (6 weeks from the first operation). Five weeks after the operation at the follow up appointment, the wound was wet with growing granulation tissue. Recurrence of the infection was considered.

The patient was advised to undergo re-operation by open debridement of the same lesion on December 26th, 2012. We also discussed about whether to remove or not remove the bioabsorbable screw at the femoral site because of the risk of recurrent infection to the patient. He decided not to have the screw removed, because he did not accept the recurrent instability which may lead to revision ACL reconstruction after the removal of the screw, and instead, accepted the risk of recurrent infection. From the intraoperative findings, we found the granulation tissue and some area of whitish debris tissue (same as the 1st debridement operation), but no frank nor bony cortex involvement of the distal femur. The preliminary report for the tissue culture for tuberculosis was acid-fast bacillus positive from liquid media and the final report (6 weeks from the operation) was positive for *Mycobacterium Abscessus* and sensitivity with Amikacin and Clarithromycin. After consulting the infectious specialist, the antibiotics prescribed included Amikacin (600 mg for 14 days), Moxifloxacin (400 mg for 14 days), and Clarithromycin 1 g for 14 days). After 14 days of operation and intravenous antibiotics, the symptoms had improved, then we discharged the patient and continued oral antibiotics including Clarithromycin 1 g and Moxifloxacin 400 mg a day.

After the 2nd operation, oral antibiotics were continued for a further 3 months as an outpatient. The wound had subsided and the patient felt no pain and could go back to work. The patient

got a new job and move to work outside of Bangkok. The last follow up was 6 months after the second operation and the patient still did not have any signs or symptoms of recurrent infection.

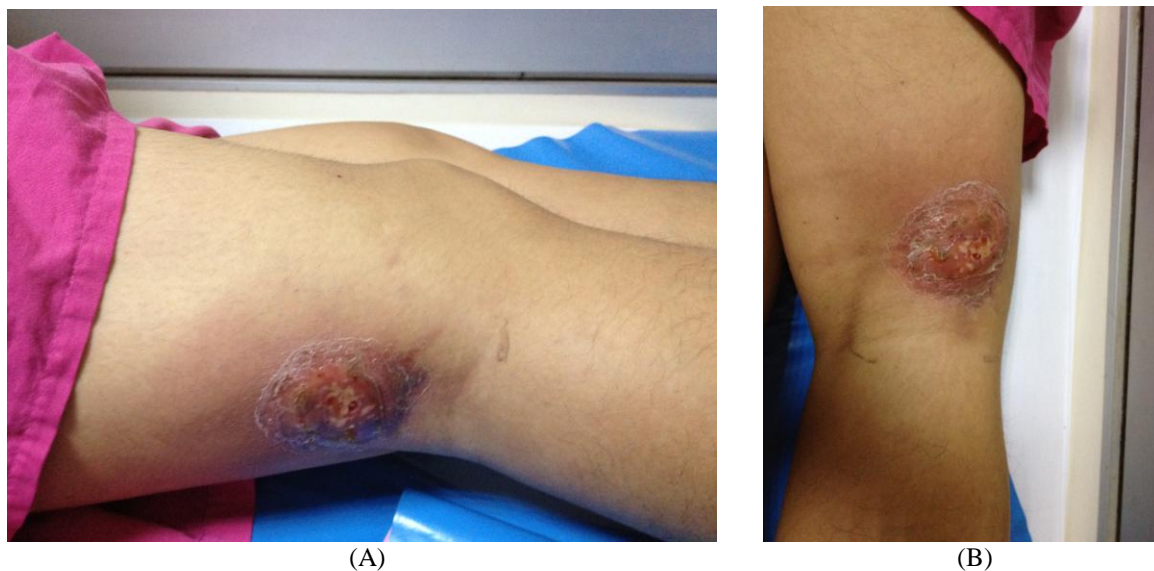


Fig. 1 (A) Lateral view (B) Posterior view of the right knee showed a 5x5 cm² mass at the posterolateral aspect of the right knee



Fig. 2 Anteroposterior radiograph of the right knee showed a femoral and tibial tunnel widening about a year after ACL reconstruction.

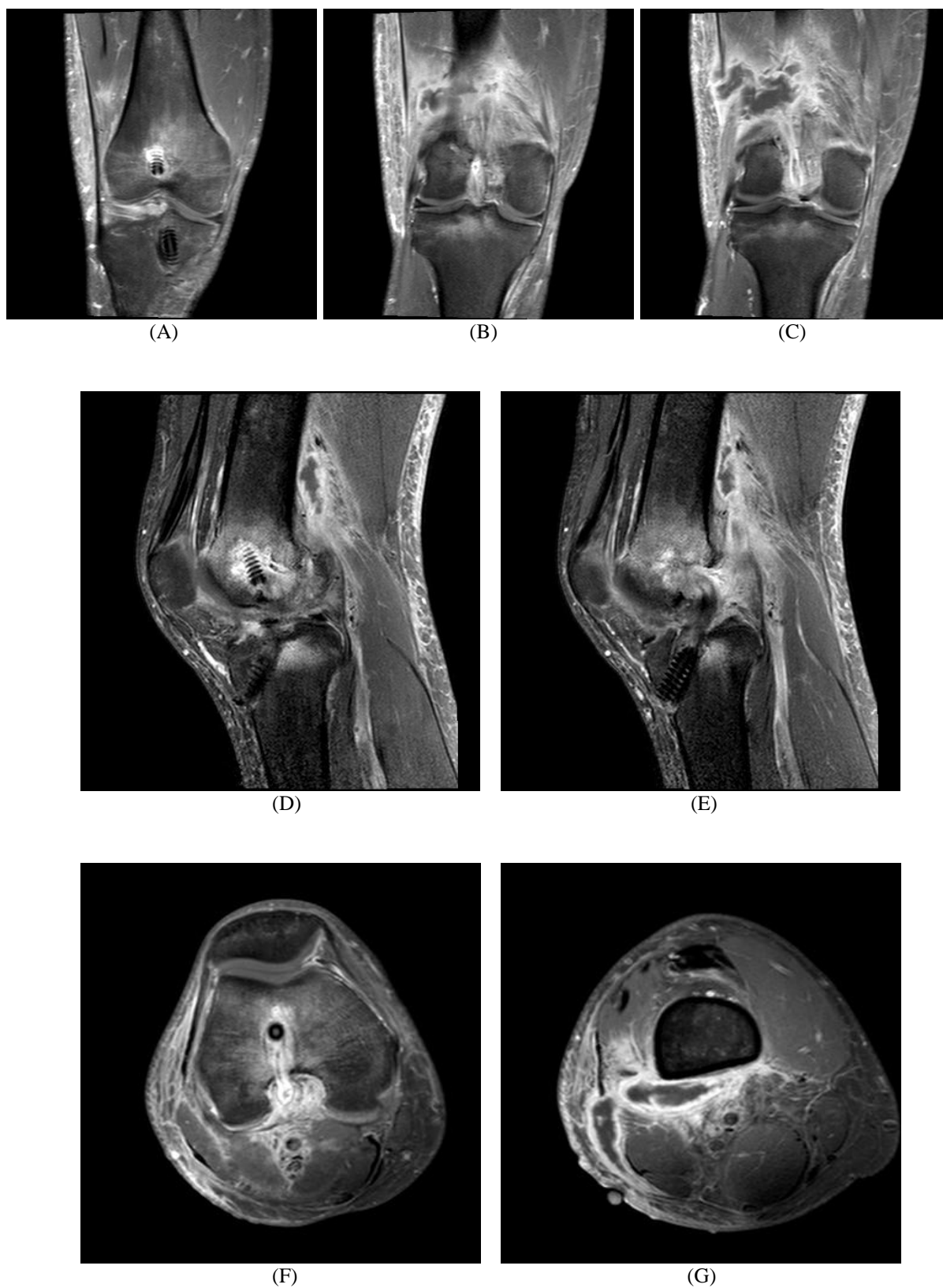


Fig. 3 The MRI of the right knee showed the enhanced signal lesions from the posterolateral corner of the knee which extended around the bioabsorbable screw in the femoral tunnel. (A-C) MRI Coronal T1W with contrast and FS. (D, E) MRI Sagittal T1W with contrast and FS. (F, G) MRI Axial T1W with contrast and FS.

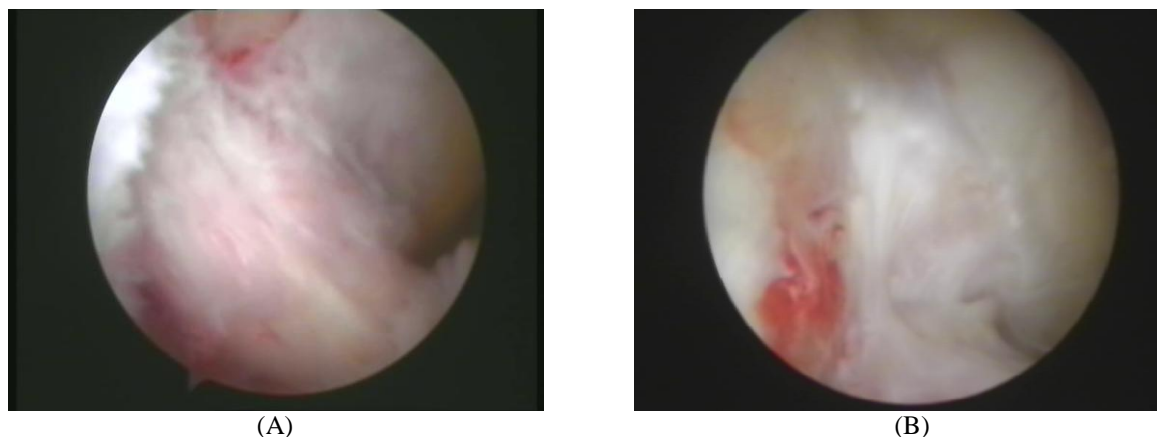


Fig. 4 (A) Arthroscopic view of the right knee showing an intact ACL graft. (B) Some adhesion at the intercondylar notch of the femur without an inflammatory reaction in the knee joint.

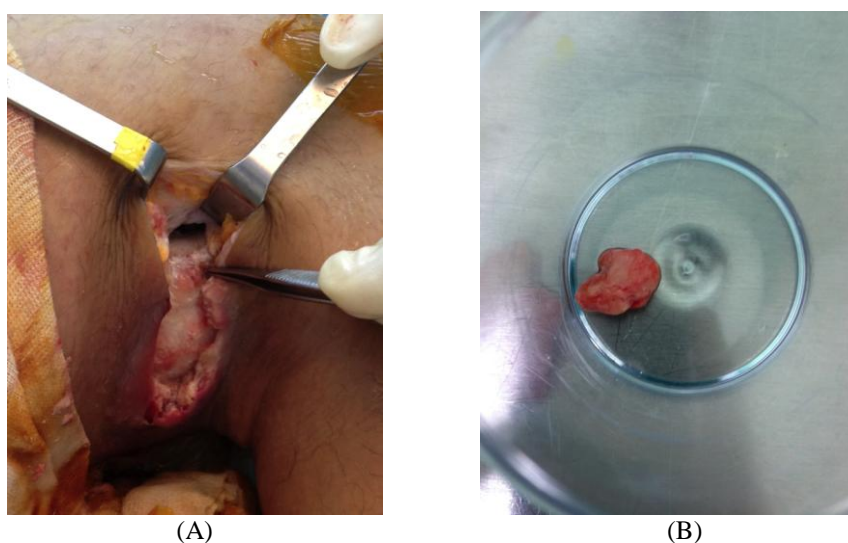


Fig. 5 (A) Intraoperative findings. (B) Tissue findings after an open debridement of the mass at the distal femur was done.

Discussion

Infection after ACL reconstruction is uncommon but has serious consequences. Tuberculous infections of the knee are also rare conditions. A non-tuberculous mycobacterial infection of the knee after ACL reconstruction is an extremely rare condition and, therefore, its diagnosis may be easily missed.

In this case, the diagnosis included a history, physical examination, and laboratory evaluation. Sending the culture for aerobic, anaerobic, *M. Tuberculosis*, and fungal infection analysis are important for the differentiation of the type of organisms and to test susceptibility to drug resistance.

From the previous studies, we found the orthopaedics report about an *M. Abscessus* infection after total knee arthroplasty. No study has reported about *M. Abscessus* infections after ACL reconstruction before.

In this case, we reported a non-tuberculous mycobacterium infection after ACL reconstruction by *M. Abscessus*. There was a report of contamination of the surgical equipment with the *Mycobacterium Abscessus* organism which contaminated the benzalkonium chloride fluid used for disinfecting the surgical equipment. The arthroscopic procedure used this disinfectant fluid for the arthroscope lens, light source, and arthroscope sheath, which may be the cause of contamination in this case. The initial treatment was open debridement of the mass on the posterolateral knee lesion with negative aerobic, anaerobic, and fungal cultures; in addition, the tissue PCR for TB was negative. The initial diagnosis was a non-infective reaction by the bioabsorbable screw. After the 5 weeks follow-up, the patient had a recurrence of the same lesion on the posterolateral knee and the 2nd debridement was done. The culture for a mycobacterium infection showed positive for an *M. Abscessus*

infection. Then we had to consult the infectious unit for proper antibiotic treatment.

From the previous study, the recommendation about the antibiotics for skin, soft tissue, and bone infections caused by *M. Abscessus* were clarithromycin 1,000 mg/day or azithromycin 250 mg/day combined with parenteral medication (amikacin, cefoxitin or imipenem). A minimum of 4 months of treatment (6 months of treatment for bone infections) is recommended⁽¹⁰⁾.

The limitations of this case report should be mentioned. Firstly, we did not perform a biopsy of the ACL graft tissue or synovial tissue for culture because the main lesion was an extra-articular lesion (at the bioabsorbable screw of the femoral tunnel). Secondly, MRI could not reveal true connection between ACL femoral tunnel and the posterolateral mass knee. Lastly, we lost follow up of the patient after he move to work outside of Bangkok.

Conclusion

In conclusion, orthopaedics surgeons should be aware of any complications, especially infection after ACL reconstruction. The suspicion for the infection should not be neglected and a complete investigation should be performed.

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การติดเชื้อ *Mycobacterium Abscessus* หลังผ่าตัดประกอบเอ็นไขว้หน้าให้คืนสภาพ: รายงานผู้ป่วย 1 ราย

วันชัย อัมพรายน, พบ, พงศ์ศักดิ์ ยุกตะนันท์, พบ

การติดเชื้อหลังผ่าตัดประกอบเอ็นไขว้หน้าให้คืนสภาพพบได้น้อย รายงานผู้ป่วยหนึ่งรายนี้เป็นการติดเชื้อ *Mycobacterium Abscessus* หลังผ่าตัดประกอบเอ็นไขว้หน้าให้คืนสภาพโดยใช้ *autologous quadruple hamstring graft* และยึดตรึงด้วย *bioabsorbable interference screw* ภายหลังการผ่าตัดหนึ่งปี ผู้ป่วยกลับมาตรวจพบก้อนทางด้านหลังข้างขวาไม่มีอาการปวด ผู้ป่วยได้รับการผ่าตัดเปิดล้างหนองที่ก้อนดังกล่าวผลการเพาะเชื้อหลัง 6 สัปดาห์ พบเชื้อ *Mycobacterium Abscessus* ได้ผลบวก และได้รับการรักษาด้วยยาปฏิชีวนะ ก้อนหนองกลับเป็นซ้ำ 3 เดือน ภายหลังจากการผ่าตัดครั้งแรก แล้วได้รับการผ่าตัดเปิดล้างซ้ำและได้รับยาปฏิชีวนะอีก 3 เดือน การตรวจการติดตามครั้งสุดท้ายที่โรงพยาบาลจุฬาลงกรณ์ แผลผ่าตัดของผู้ป่วยหายดี และไม่มีอาการผิดปกติ รายงานผู้ป่วยนี้เป็นรายแรกของการติดเชื้อ *Mycobacterium Abscessus* หลังผ่าตัดประกอบเอ็นไขว้หน้าให้คืนสภาพ
