

Clinical Outcomes of Revision Hip Arthroscopy for Synovial Chondromatosis

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Abstract

Background: Synovial chondromatosis (SC) is a relatively rare disease and there were few studies on causes and clinical outcomes of revision surgery for SC. The purpose of this study was to evaluate clinical outcomes of revision hip arthroscopy for synovial chondromatosis.

Methods: We evaluated consecutive patients who underwent revision hip arthroscopy for SC in our hospital between January 2008 and January 2020. Radiographic evaluation was made before and after surgery. Preoperative patient-reported outcomes (PROs) and PROs at final follow-up were obtained, including visual analog scale (VAS) for pain, the International Hip Outcome Tool-12 (iHOT-12) and modified Harris Hip Score (mHHS).

Results: A total of 8 patients (mean age, 39.5 years; age range, 27-62 years; 5 males and 3 females) were included in this study. The recurrence rate of hip SC in our hospital was 6.8%. The average follow-up period after surgery was 47.3 months (range, 12–120 months). Before surgery, mean mHHS was 60.6 ± 17.3 (range, 20-77), mean iHOT-12 was 43.8 ± 13.7 (range, 18-69), and mean VAS was 3.1 ± 1.7 (range, 1-7). At the final post-operative follow-up, mean mHHS was 83.8 ± 16.6 (range, 43-91), iHOT-12 was 80.6 ± 19.7 (range, 32-90), and mean VAS was 0.6 ± 1.8 (range, 0-5). All results demonstrated statistically significant improvement ($P < 0.05$). Recurrence of SC was found in 2 patients 1 year and 4 years after revision hip arthroscopy, respectively.

Conclusion: Hip arthroscopy had good clinical outcomes for revision surgery of SC.

Background

Synovial chondromatosis (SC) is a relatively rare and benign idiopathic disease characterized by metaplasia of the synovial membrane and formation of multiple calcified nodules.[1, 2] Intra-articular loose bodies can lead to articular cartilage damage and cause joint degeneration.[3] Surgical removal of loose bodies using open or arthroscopic approaches presented good clinical results.[1, 3-13] SC tends to recur and Darren et al. reported an approximate recurrence of 7.1% after arthroscopic removal of loose bodies and synovectomy.[10] Boyer and Dorfmann reported that SC recurred in 38.8% of cases, and revision surgery using open or arthroscopic approach was conducted.[14] Lee et al.[1] reported recurrence of 16.7%, Ferro et al.[8] reported 2 patients who underwent revision surgery after primary hip arthroscopy for SC and Zhang et al.[3] reported 2 patients underwent revision arthroscopy because of adhesions within the hip or recurrent SC. However, there were few studies on causes and clinical outcomes of revision surgery for SC.

We hypothesized that hip arthroscopy had good clinical outcomes for revision surgery of SC.

Methods

Patients

We evaluated consecutive patients who underwent revision hip arthroscopy for SC in our hospital between January 2008 and January 2020. The inclusion criteria were as follows: (1) patients were diagnosed with SC and underwent primary hip arthroscopy for SC in our hospital or other hospitals; and (2) underwent revision hip arthroscopy because of unrelieved symptoms or limited range of motion (ROM). Patients who could not complete the clinical follow-up were excluded from the study. All participants signed informed consent. The study was approved by an institutional review board.

Physical examination and radiographic assessment

All patients underwent a systematic physical examination. Flexion, adduction, and internal rotation (FADIR) or flexion abduction external rotation (FABER) tests are considered positive if hip or groin pain was elicited when the hip was placed in 90° of flexion and then adduction and internal rotation or flexion, abduction and external rotation applied.[15] Supine anteroposterior hip radiographs, cross-table lateral radiographs, CT images, and MR images were obtained for all patients preoperatively (Figure 1). Cross-table lateral radiographs and CT images were obtained for all patients postoperatively. Preoperative alpha angle and lateral center-edge angle (LCEA) were measured as described by previous studies.[16, 17]

Surgical procedure

One surgeon with more than one decade of experience of this procedure performed standard hip joint arthroscopy for all patients. The basic procedure was as described by Zhang et al.[3] For patients with recurrence or remaining loose body,

peripheral compartment was explored firstly without joint distraction at 45 degrees of hip flexion using 30°-arthroscopes. Most of the recurrent or remaining loose bodies could be removed by lavage, and larger ones could be removed using a grasper. Secondly, traction was applied to the operative extremity and a radiofrequency tool was used to complete capsulotomy. Detailed inspection of the central compartment was undertaken to assess the acetabular rim, acetabular labrum, articular cartilage, and ligamentum teres using 70°-arthroscopes. Removal of loose bodies and synovectomy was done. Articular cartilage lesions of the acetabulum and femoral head were evaluated according to the Outerbridge classification.[18] Labral repair or labral debridement was performed according to the nature of injury. If a cam bump in the head-neck junction or acetabular overcoverage was identified, femoral osteoplasty or acetabuloplasty was performed. Finally, the hip was moved into 45° of flexion and various degrees of rotation for thorough inspection of the peripheral compartment again after traction release. Revision surgery was much more difficult than primary surgery. The most common sites of remaining or recurrent SC were medial joint recess, posterior capsule, and acetabular fossa. These areas could be treated to the greatest extent by using curved shaver, curved nucleus pulposus forceps at the position of internal and external rotation under hip flexion.

Outcomes evaluation

Preoperative patient-reported outcomes (PROs) and PROs at final follow-up were obtained, including visual analog scale (VAS) for pain, the International Hip Outcome Tool-12 (iHOT-12) and modified Harris Hip Score (mHHS). Complications or revision hip arthroscopy were recorded.

Statistics

The two-tailed paired t test was used to evaluate significance between preoperative and postoperative PROs. P values $<.05$ were considered statistically significant. All statistical analyses were performed with SPSS Statistics, version 22 (IBM).

Results

During the study period, a total of 74 patients underwent hip arthroscopy for SC in our hospital. Eight patients underwent revision hip arthroscopy during this time. Five patients underwent primary hip arthroscopy in our hospital and 3 patients underwent primary surgery in the other hospitals. The recurrence rate of hip SC in our hospital was 6.8%. As shown in Table 1, a total of 8 patients (mean age, 39.5 years; age range, 27–62 years; 5 males and 3 females) were included in this study. There were 4 left sides and 4 right sides. The mean body mass index (BMI) was 22.6 (range, 19.1–26.8). The mean time between primary surgery and revision surgery was 30.8 months (range, 4–96 months). The FADIR test as evaluated by the treating physician was positive in 6 (75%) patients. The physician obtained a positive FABER test in all patients. Mean preoperative alpha angle and LCEA were 58.4 ± 8.8 (range, 49.9–75.6) and 30.8 ± 5.7 (range, 22.3–39.9), respectively.

Table 1
Demography of patients (n = 8)

Parameter	Data
Age, y, mean (range)	39.5 (27–62)
Gender	
Male	5 (62.5%)
Female	3 (37.5%)
BMI, kg/m ² , mean (range)	22.6 (19.1–26.8)
FADIR test	
Positive	6 (75%)
Negative	2 (25%)
FABER test	
Positive	8 (100%)
Negative	0
Time between primary and revision surgery, month, mean (range)	30.8 (4–96)
Follow-up time, month, mean (range)	47.3 (12–120)
Alpha angle, degree, mean (range)	58.4 (49.9–75.6)
LCEA, degree, mean (range)	30.8 (22.3–39.9)
NOTE. Unless otherwise specified, data are numbers of patients, with percentages in parentheses.	

Diagnosis before revision arthroscopy of these patients was shown in Table 2. Among these 8 patients, 7 (87.5%) patients were diagnosed with recurrent SC, 1 (12.5%) patients were diagnosed with remaining loose bodies, 2 (25%) patients were diagnosed with joint adhesion, 4 (50%) patients were diagnosed with combined femoroacetabular impingement (FAI). Seven (87.5%) patients underwent arthroscopic removal of loose bodies, 5 (62.5%) patients underwent synovectomy, 4 (50%) patients underwent femoral osteoplasty, 4 (50%) patients underwent acetabuloplasty, 2 (25%) patients underwent adhesion release and 3 (37.5%) patients underwent labral repair. There were 3 (33.3%) patients who had Outerbridge I or II femoral cartilage damages, 2 (16.7%) patients who had Outerbridge I or II acetabular cartilage damages, 3 patients (50%) who had Outerbridge III acetabular cartilage damages, and 3 (16.7%) patients who had Outerbridge IV femoral cartilage damages.

Table 2
Diagnosis Before Revision Surgery and Arthroscopic Findings

	Data
Diagnosis	
Recurrent SC	7 (87.5%)
Remaining loose body	1 (12.5%)
Adhesion	2 (25%)
FAI	4 (50%)
Surgical procedure	
Removal of loose body	7 (87.5%)
Synovectomy	5 (62.5%)
Femoral osteoplasty	4 (50%)
Acetabuloplasty	3 (37.5%)
Labral repair	3 (37.5%)
Adhesion release	2 (25%)
NOTE. Unless otherwise specified, data are numbers of patients, with percentages in parentheses.	

The average follow-up period after surgery was 47.3 months (range, 12–120 months). Before surgery, mean mHHS was 60.6 ± 17.3 (range, 20–77), mean iHOT-12 was 43.8 ± 13.7 (range, 18–69), and mean VAS was 3.1 ± 1.7 (range, 1–7). At the final post-operative follow-up, mean mHHS was 83.8 ± 16.6 (range, 43–91), iHOT-12 was 80.6 ± 19.7 (range, 32–90), and mean VAS was 0.6 ± 1.8 (range, 0–5). All results demonstrated statistically significant improvement ($P < 0.05$). Recurrence of SC was found in 2 patients 1 year and 4 years after revision hip arthroscopy, respectively. The two patients did not undergo another surgery.

Discussion

In this study, we found that hip arthroscopy had good clinical outcomes for revision surgery of SC. The VAS, mHHS and iHOT-12 improved significantly at final follow-up. The mean mHHS improved from 60.6 ± 17.3 to 83.8 ± 16.6 at final follow-up. The mean iHOT-12 improved from 43.8 ± 13.7 to 80.6 ± 19.7 and VAS improved from 3.1 ± 1.7 to 0.6 ± 1.8 at final follow-up. Two patients had recurrence of SC 1 year and 4 years after revision hip arthroscopy.

Several studies have proved that the arthroscopic approach had good clinical outcomes for SC of hip.[1, 3–5, 8, 14, 19] SC tends to recur and recurrence rate was reported from 7.1–38.8% after arthroscopic

removal of loose bodies and synovectomy.[1, 10, 14] The recurrence rate in our hospital was 6.8%, which was similar to what Darren et al.[10] reported. Boyer and Dorfmann evaluated outcomes in 69 patients treated with arthroscopy alone, of whom 51 required no further treatment and 18 required further arthroscopies.[14] Of these 18 patients, eight had an excellent outcome, nine had a good outcome, and the treatment failed in one. Lee et al.[1] reported recurrence in 4 of 24 patients who underwent hip arthroscopy for SC and these 4 patients underwent revision arthroscopy. SC recurred again in 1 of the 4 cases and a third surgery was performed. Ferro et al.[8] reported 1 patients who underwent two revision surgeries after primary hip arthroscopy for SC and finally underwent total hip replacement 4 years after the initial hip arthroscopy. Zhang et al.[3] reported 2 patients underwent revision arthroscopy because of adhesions within the hip or recurrent SC. Several revision hip arthroscopies for SC had been reported. However, the clinical outcomes of revision arthroscopy were quite different and current studies did not have detailed clinical follow-up. We evaluated consecutive patients who underwent revision hip arthroscopy for SC in our hospital and proved that that hip arthroscopy had good clinical outcomes for revision surgery of SC. The mean time between primary surgery and revision surgery was 30.8 months (range, 4–96 months) in this study. Lee et al. reported the average period between the first surgery and recurrence was 3.2 years (range, 0.8–3.8 years).[1] Boyer et al. reported the mean time between the first and second arthroscopies was three years.[14] The time between primary surgery and revision surgery of the three studies was similar.

According to the current researches, the main causes for revision arthroscopy were recurrent SC and adhesion. In this study, 7 patients underwent revision surgery because of recurrent SC, 2 patients underwent revision surgery because of adhesion and one because of remaining loose bodies. One of the two patients with adhesion had recurrent SC and we thought recurrent SC may be the reason of adhesion. One patient did not achieve good clinical results. Her mHHS improved from 20 preoperatively to 43 postoperatively and iHOT-12 improved from 18 preoperatively to 32 postoperatively. VAS improved from 7 to 5. Recurrence of SC was found 4 years after revision arthroscopy. At final follow-up, range of motion of this patient improved, but the symptoms did not improve much. Recurrence of SC was found in 2 patients 1 year and 4 years after revision hip arthroscopy, respectively. Lee et al. [1] reported that the symptomatic SC recurred in 4 of 24 cases who underwent hip arthroscopy and symptomatic disease recurred again in 1 of the 4 cases, and thus, a third surgery was performed. The condition of the patient who underwent the third surgery was exacerbated because of adhesions resulting from extensive intrajoint synovectomy, and the range of motion of the hip joint was decreased after surgery compared with the patient's condition before surgery.[1] Ferro et al.[8] reported 1 patients who underwent two revision surgeries for SC and finally underwent total hip replacement 4 years after the initial hip arthroscopy. In this study, the two patients who had recurrence of SC after revision arthroscopy did not accept third surgery. SC tends to recur whether after primary surgery or revision surgery. It should be mentioned that one patient in this study underwent hip arthroscopy for SC as primary surgery and underwent open surgery for recurrent SC as the second surgery in another hospital. This patient underwent hip arthroscopy for SC as the third surgery in our hospital. This patient had serious recurrence after second open surgery and the SC expanded along the incision and some even grew to obturator externus muscle, which made the third

arthroscopy surgery so difficult that it was impossible to remove SC completely (Fig. 2). This patient was satisfied with the outcomes of third arthroscopy surgery. At one-year follow-up, this patient had no obvious discomfort and could walk and live normally. He felt a little discomfort only when the hip flexion angle was more than 110 degrees.

It should be noticed that 4 in 8 patients who underwent revision arthroscopy had combined FAI. Such a high rate of combined FAI may be related to repeated stimulation of SC. The association between FAI and SC has been reported previously by Padhy et al. in 2009, who described a case of FAI accompanied by SC.[20] Abolghasemian et al. proposed that SC can induce changes compatible with typical cam-type FAI, and that this can represent another mechanism leading to hip osteoarthritis in patients with SC.[21] The presence of unilateral cam-type impingement can be a clue to a possible diagnosis of underlying SC.[21]

This study had several limitations. First, the sample size of this study was small. However, the patients who underwent revision arthroscopy for SC was scarce. Second, the time of follow-up ranged from 12 months to 120 months. One patient had a relatively short follow-up.

In conclusion, hip arthroscopy had good clinical outcomes for revision surgery of SC.

Abbreviations

SC: synovial chondromatosis; LCEA: lateral center-edge angle; PROs: patient-reported outcomes; FADIR: flexion, adduction, and internal rotation; FABER: flexion abduction external rotation; FAI: femoroacetabular impingement

Declarations

Acknowledgement

Not applicable

Authors' contributions

GGY: study design, data acquisition, analyses and interpretation of data, draft of manuscripts, tables and figures. HHJ; study design, data acquisition, analyses and interpretation of data. AYF; analyses and interpretation of data, manuscript with tables and figures. WJQ; study design, data acquisition, analyses and interpretation of data, manuscript with tables and figures. XY; study design, data acquisition, analyses and interpretation of data, manuscript with tables and figures. All authors critically reviewed and approved the final revised manuscript.

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Availability of data and materials

All relevant data supporting the conclusions are included within the article and tables. The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Ethical approval The Ethics Committee of the Third Hospital of Peking University approved this study (ID number 201931802). Informed consent was obtained from all individual participants included in the study. All methods were performed in accordance with the guidelines and regulations of the Ethics Committee of the Third Hospital of Peking University.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

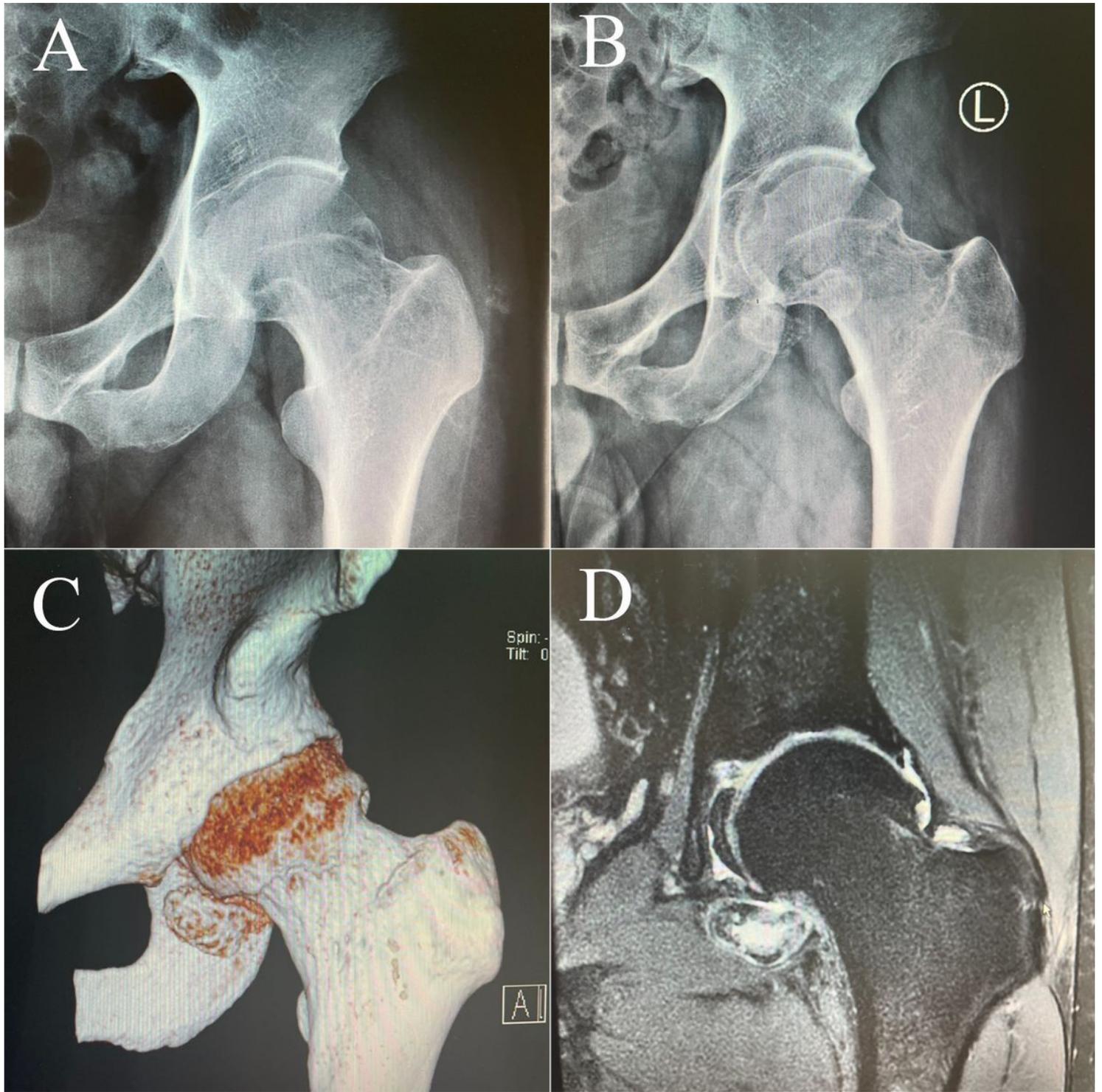


Figure 1

A. Anteroposterior hip radiographs after primary hip arthroscopy for left side hip SC. B. Anteroposterior hip radiographs before revision hip arthroscopy for SC in the same patient. C. CT images before revision hip arthroscopy. D. MR images before revision hip arthroscopy.

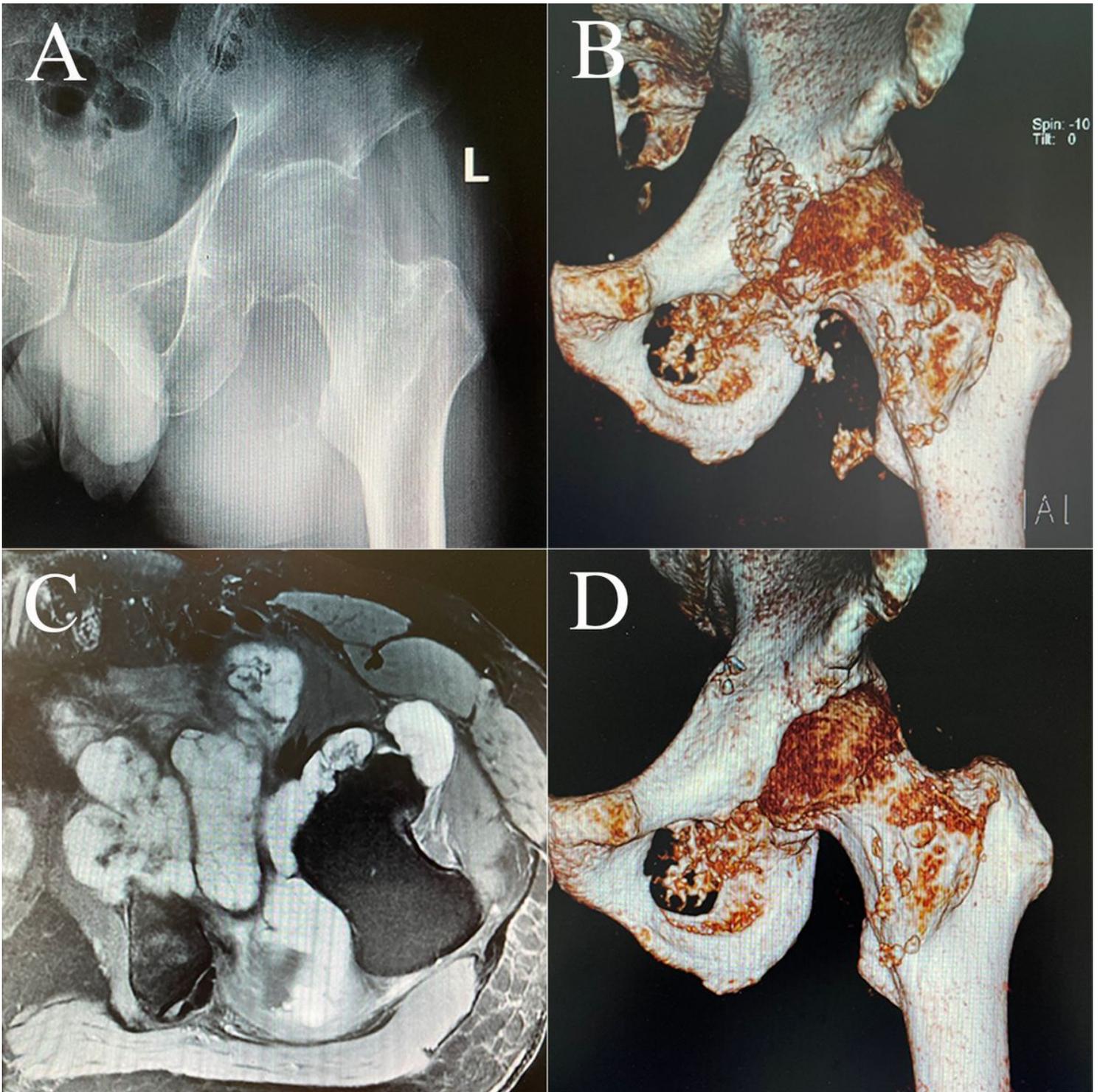


Figure 2

A. Anteroposterior hip radiographs before third arthroscopy surgery for left side hip SC. B. CT images before third revision hip arthroscopy for SC in the same patient. C. MR images before third revision hip arthroscopy. D. CT images after third revision hip arthroscopy.