**CARE Checklist of information to include when writing a case report**

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| **Topic**  |  | **Item**  | **Checklist item description**  |  |  | **Reported on Line**  |

**Title 1** The diagnosis or intervention of primary focus followed by the words “case report” : **Successful treatment of a symptomatic unicameral calcaneus bone cyst by cement injection using a double needle technique under CT guidance: a case report**

**Key Words 2** 2 to 5 key words that identify diagnoses or interventions in this case report, including "case report": Simple bone cyst, percutaneous cement injection, minimally invasive treatment, unicameral bone cyst of the calcaneus, case report.

**Abstract**

**(no references) 3a** Introduction: What is unique about this case and what does it add to the scientific literature? Abstract/background/paragraph 1

 **3b** Main symptoms and/or important clinical findings: A 16-year old girl presented with an 8-day history of pain and swelling over the right calcaneal region.

 **3c** The main diagnoses, therapeutic interventions, and outcomes: In an outpatient setting, under conscious sedation, two interosseous needles were simultaneously inserted into the cyst under the guidance of CT fluoroscopy. Without aspiration, a radiopaque bone cement mixture was injected into the cyst from one needle until the cessation of serosanguineous fluid efflux from the second needle. Over a one-year follow-up period, the patient recovered without any complications

 **3d** Conclusion—What is the main “take-away” lesson(s) from this case? Bone cement injection using a double needle technique under CT fluoroscopy guidance is a feasible and safe method to treat symptomatic unicameral calcaneal bone cysts.

**Introduction**

**Patient Information 4** One or two paragraphs summarizing why this case is unique (**may include** reference**s**): Simple bone cysts (SBCs) are benign cavitary lesions within the metaphysical region of bones. They can be unicameral (single chamber) or with partial septations. Unicameral bone cysts are well-defined cystic cavities filled with serious or serosanguineous fluid, which is lined by a fibrovascular connective tissue membrane. The precise etiology of UBCs has not been determined, but some researchers have suggested that venous outflow obstruction may be responsible for cystic cavitation filled with fluid. These lesions most commonly affect children and adolescent males (with a 2-3:1 male to female ratio) in the first two decades of life, are most often observed in the proximal regions of the humerus and femur (accounting for up to 80% of cases) and are relatively uncommon in the calcaneus. UBCs of the calcaneus mostly arise from the anterolateral aspect of the bone, far away from the area in which most of the body weight is transmitted. Although these lesions are mainly asymptomatic, they can present with pain or pathological fractures due to structural weakness.

various methods have been proposed to manage UBCs, including observation, intralesional steroid injection, percutaneous or open curettage with or without bone grafting, percutaneous injection of allogenic demineralized bone matrix and cannulated pin/screw insertion. However, minimally invasive techniques are far more desirable due to the higher healing rate, a lack of recurrence and the preservation of the periosteum, muscles, blood supply and shorter recovery time.

 **5a** De-identified patient specific information: N/A

 **5b** Primary concerns and symptoms of the patient: pain and swelling over the right hind foot and calcaneal region and difficulty bearing weight over a period of 8 days. She had suffered from mild pain in the right calcaneus intermittently since the age of 3, which had been relieved with rest and cold compression, but approximately 3 weeks prior to her coming to our center, the pain had become constant. The pain had increased over an 8-day period during which the patient had been playing volleyball most of the day.

**5c** Medical, family, and psycho-social history including relevant genetic information: She had suffered from mild pain in the right calcaneus intermittently since the age of 3, which had been relieved with rest and cold compression, but approximately 3 weeks prior to her coming to our center, the pain had become constant.

 **5d** Relevant past interventions with outcomes: n/a

**Clinical Findings 6** Describe significant physical examination (PE) and important clinical findings: case presentation /paraghraph 1

**Timeline 7** Historical and current information from this episode of care organized as a timeline: case presentation/paraghraph 1,2

**Diagnostic**

**Assessment 8a** Diagnostic testing (such as PE, laboratory testing, imaging, surveys): Routine lab tests, magnetic resonance imaging (MRI), plane radiography.

 **8b** Diagnostic challenges (such as access to testing, financial, or cultural): N/A

 **8c** Diagnosis (including other diagnoses considered): N/A

 **8d** Prognosis (such as staging in oncology) where applicable: N/A

**Therapeutic**

**Intervention 9a** Types of therapeutic intervention (such as pharmacologic, surgical, preventive, self-care): minimally invasive technique utilizing 2 interosseous needles with the injection of cement into the cyst without aspiration.

 **9b** Administration of therapeutic intervention (such as dosage, strength, duration): case presentation/paraghraph 4,5

 **9c** Changes in therapeutic intervention (with rationale): N/A

**Follow-up and**

**Outcomes 10a** Clinician and patient-assessed outcomes (if available): After the procedure, the patient’s hemodynamic status was stable and he recovered without any serious complications.

 **10b** Important follow-up diagnostic and other test results: On patient follow- ups conducted approximately 6 months and one year after the procedure, there were no reports of itching or warmth at the site of the procedure and no complaints of limping. The patient had experienced a few scattered episodes of mild pain after prolonged standing, which had been relieved with rest.

 **10c** Intervention adherence and tolerability (How was this assessed?): The types of measures of adherence were self-report.

 **10d** Adverse and unanticipated events: N/A

**Discussion 11a** A scientific discussion of the strengths AND limitations associated with this case report: Discussion paragraph 1, last.

 **11b** Discussion of the relevant medical literature **with references & 11c :**

A variety of strategies ranging from non-operative management, intralesional steroid injection, percutaneous or open curettage with or without bone grafting, percutaneous injection of allogenic demineralized bone matrix to more invasive procedures, such as cannulated pin/screw insertion and surgical procedures have demonstrated acceptable efficacy. However, the optimal management of these lesions remains an issue of debate. In patients who are incidentally diagnosed and have no risk of pathological bone fractures, non-operative management with close follow-up is recommended. Spontaneous resolution of heel pain has been reported in 1 to 2% of patients managed non-operatively (1, 2).

Intralesional steroid injection was first introduced as a successful management strategy for simple bone cysts. Despite the reported outcomes, recent studies on calcaneal UBCs have demonstrated a high recurrence rate even after multiple steroid injections (3, 4). Scaglietti et al reported only 24% cyst healing after a single injection and incomplete healing even after multiple injections. Glaser et al (5) performed 9 steroid injections on 6 patients and curettage combined with bone grafting on 9 patients. All of their patients were asymptomatic and the study reported a 0 healing rate with persistent cysts in 2 of the cases injected which steroids and complete healing without recurrence in cases who underwent curettage with bone grafting after a minimum follow-up period of 12 months. Moreover, a few studies have suggested that the steroids have minimal effect with regards to resolving the cyst, and that the mechanical effect of punctures, which helps normalise local circulation, is the key factor.

Percutaneous or open curettage, which can be performed with or without bone grafting, is the traditional method for the management of symptomatic calcaneal UBCs. Although open curettage with bone grafting has demonstrated significant improvement in the resolution of heel pain, it has been associated with a high recurrence rate in cases where the graft had been incompletely packed (6). Innami et al (7) performed endoscopic curettage in conjunction with percutaneous injection of calcium phosphate to treat symptomatic calcaneal UBCs. Their findings showed the complete resolution of pain and radiological healing in all patients after a follow-up period of 3 years. Aiba et al (8) performed endoscopic curettage on 6 calcaneal UBCs and reported complete healing after a mean follow-up period of 4 months without cyst residue.

Abdel-Wanis et al (9) used minimal curettage, multiple drilling and continuous decompression as an alternative to autografting in children. Due to the patients’ young age, harvesting a large volume of autographs can be difficult. On the other hand, the risk of disease transmission by autografting should not be overlooked, no matter how small. This study reported complete radiographic healing in all patients and total pain relief without recurrence in 59% of cases. Other methods, such as a cannulated screw placed for continuous decompression, have demonstrated lower recurrence rates, higher rates of healing and a significant reduction in heel pain following decompression. Saraph V et al (10) treated 9 calcaneal UBCs with continuous decompression using cannulated screws, among whom 8 cases showed complete healing and one showed a residual region on imaging with complete pain relief after a minimum follow-up period of 24 months. The only complication reported in the study was irritation at the screw insertion site observed in one patient, which led to early removal of the screw. Shirai et al (11) managed 23 simple bone cysts in the calcaneus by using cannulated hydroxyapatite (HA) pins, which were used to achieve continuous decompression. After a mean follow-up period of 5 months, their results showed complete healing in all patients. In another study, Park et al (12) compared open chip allogenic bone grafting with percutaneous injection of bone powder. Complete healing was reported in 70% of open chip allogenic bone grafts and 50% of cases percutaneously injected with bone powder after a mean follow-up up of 49.4 months. Persistent cysts were reported in 15% of cases treated using open chip allogenic bone grafts and 20% of those managed by percutaneous injection of bone powder.

 **11d** The primary “take-away” lessons of this case report (without references) in a one paragraph conclusion: discussion/last paraghraph

**Patient Perspective 12** The patient should share their perspective in one to two paragraphs on the treatment(s) they received: the procedure performed for my problem improved my condition and stopped the pain. The rapidity of this method and no need for general anesthesia were the important positive points of this method.

**Informed Consent 13** Did the patient give informed consent? Please provide if requested. Written informed consent was obtained from the patient prior to the procedure

**References:**

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12. Park IH, Micic ID, Jeon IH. A study of 23 unicameral bone cysts of the calcaneus: open chip allogeneic bone graft versus percutaneous injection of bone powder with autogenous bone marrow. Foot Ankle Int. 2008;29(2):164-70.