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Osteochondroma at the Ventro-Medial Surface of the Scapula Causing Pseudo Winging Scapular Resection with Computer-Assisted Navigation: A Case Report and Literature Review

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Purpose: Osteochondromas, the most common benign bone tumors, primarily occur in the long bones, with scapular osteochondromas constituting less than 1% of cases. A unique challenge in ventral scapular osteochondromas is limited visibility from the dorsal side. Computer-assisted surgery, which is widely employed in tumor surgery is a promising solution for minimally invasive resection with reduced muscle injury.

Methods: We present the case of a thirteen-year-old female with a ventral scapular osteochondroma that cause winging and snaping of her left arm. The patient underwent computer-assisted surgery under general anesthesia in the prone position. The procedure involved a minimal incision over the crest of the scapular spine, enabling precise identification of the tumor from the dorsal side using navigation tools.

Results: The tumor, identified as an osteochondroma on CT scans, was successfully resected with minimal soft tissue damage. Postoperatively, the patient's arm was immobilized for two weeks, followed by a pain-free return to normal activity. Radiographic evaluation confirmed complete tumor removal.

Conclusions: Computer-assisted navigation can help locate the ventral osteochondroma of the scapula with minimal soft tissue damage and a quicker recovery time.

Keywords: osteochondroma, scapular tumor, computer navigated axis surgery

Osteochondromas are the most common benign bone tumors that are composed of medullary and cartilaginous bone covered by a cap of hyaline cartilage[1]. They are primarily found in long bones and increase in size with skeletal growth until skeletal maturity[2]. Scapular osteochondromas are rare, accounting for less than 1% of all osteochondromas[3-4]. However, they are the most common type of scapular tumors[5].

Currently, computer-assistance is widely used in tumor surgery, particularly for pelvic and sacral tumors. MIS resection of benign bone tumors is an indication for this technique[6]. In the past, several techniques have been used for resecting osteochondromas, including open resection with a triangle of auscultation approach[7] 3D models printed from DICOM files to help in surgery planning[8], minimally invasive techniques[9], and

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arthroscopic techniques[3]. However, the problem with ventral osteochondroma of the scapula is that it cannot be seen from the dorsal site. Therefore, we decided that computer-assisted surgery would be beneficial in this case to perform resection with minimal invasiveness and muscle injury.

CASE REPORT

A thirteen-year-old, right hand dominant girl presented to our orthopedic clinic with snapping on motion of her left arm for 9 months. Her left scapula had moved significantly anterolateral to the thoracic cage and slightly superior to the right side.

An anteroposterior view of the left shoulder joint with abnormal calcification at the medial border of the left scapula and a standard Y-view of the scapula clearly demonstrated that the tumor arose from the ventral aspect of the inferomedial border of the scapula.

CT reveled extension of the tumor over the ventral surface of the left scapula and lateral pushing of the left scapula, casing scapular winging.

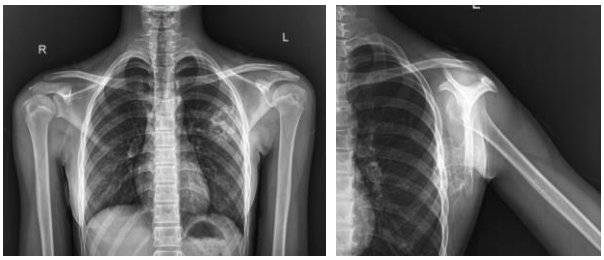

Fig. 1 Plain radiography anterioposterior view and standard Y-view of the scapula.

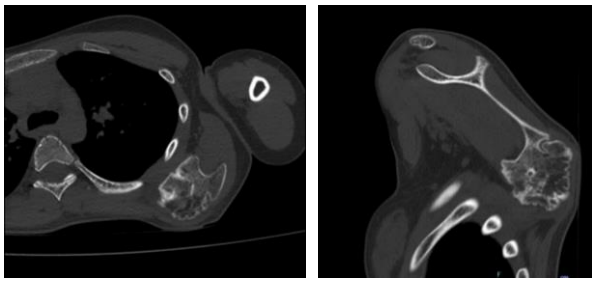

Fig. 2 CT scan showing osteochondroma arising from the left scapula.

The procedure was performed under general anesthesia, with the patient in the prone position. Her left shoulder was free and the scapula could move over the thoracic cage. A small incision was made over the crest of the scapula spine near the posterior part of the acromion. Five centimeters incision was made at the inferior pole of the scapula. We used 3-point acquisition at the medial border of the scapula and surface registration (Calibration using multiple points on the scapula).

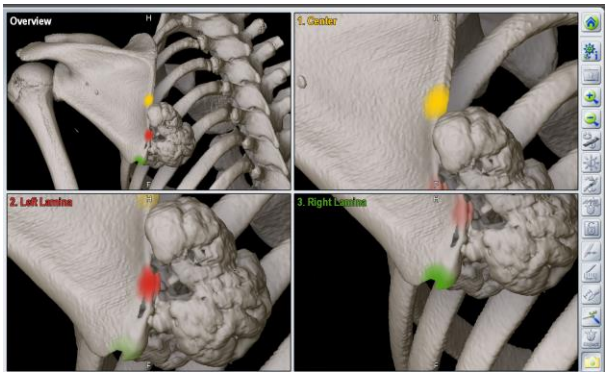

Fig. 3 Three-point registration at the medial border of the left scapula.

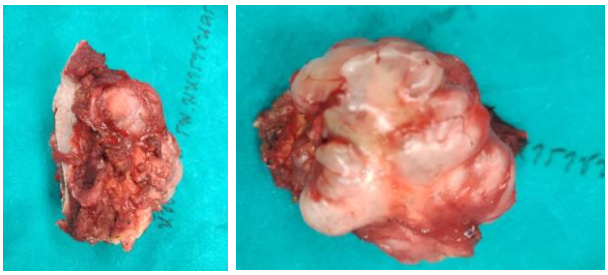

Fig. 4 Osteochondroma after resection.

After registration, a navigated probe can be used to identify tumors from the dorsal side. We used a Misonix Bone ScalPel blade to cut the bone and detach the inferior scapular and rhomboid muscles from the medial border of the tumor. After tumor removal, the muscle was reattached to the lower pole of the scapula, a drain was inserted, and the skin was closed. The resected tumor is shown in the Fig 4. The intraoperative duration spanned 1 h 30 min, with a blood loss of 50 mL.

Macroscopically, a pearly white hard mass extending from the scapula was observed, and the pathological report indicated that it was an osteochondroma.

Her arm was immobilized in an arm sling for 2 weeks, after which she could move her arm freely without pain. Plain radiography showed that the tumor was completely removed.

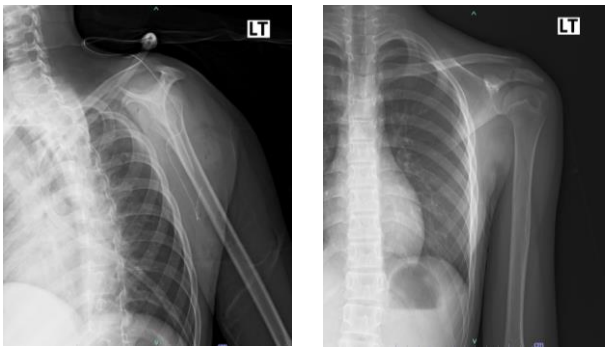

Fig. 5 Post-operative plain radiography showing complete resection.

DISCUSSION

Osteochondromas are the most common benign bone tumors, accounting for 15% of all bone tumors[5]. However, ventral osteochondromas of winging scapula are rare. A asymptomatic patients without pain or snaping can undergo non-operative treatment and follow-up measurements[10]. However, in the cases that lead to limitations in sports activities or impact the quality of life, surgical resection remains the treatment of choice.

In 2011, Pérez D et. al. used endoscopic guidance to resect a superomedial osteochondroma of the scapula. Minimally invasive resection of scapular osteochondromas has been proposed as an alternative to open surgery for early functional recovery[9]. In 2012, Tam MD et. al. used 3D printed model from a DICOM file for surgical planning in large scapular osteochondromas and tumor location during surgery[7]. In 2019, Sage et.al. reported case series of ventral scapular resected muscle spearing techniques with "triangular of auscultation" approach[11].

However, open resection from the medial or lateral border remained the standard approach in this case[12-20]. Ventral osteochondromas cannot be seen from the dorsal side and more associated muscles that attach to the scapula need to be resected, especially in large osteochondromas. Therefore, we propose a new technique that uses computer-assisted navigation to resect tumors. The scapula can glide over the rib cage, and the incision can be optimizied and resection can be performed with minimal muscle trauma. Although this may result in an increase in operative time, blood loss is slightly reduced. In this case, The patient returned to daily activities within 2 weeks of resection. Plain radiography and CT showed complete resection of the osteochondroma.

Computer-assistance is widely used in tumor surgery, particularly for pelvic and sacral tumors. This technique has the benefits of precise dissection, minimal damage to soft tissue, minimal invasiveness and a smaller incision, resulting in reduced post-operative pain, shorter hospital stays and less recovery time.

CONCLUSIONS

Here, we report the case of a 13-year-old girl with ventral scapular osteochondroma, highlighting the efficacy of computer-assisted navigation. This innovative technique allows complete tumor resection, minimizes soft tissue damage, and reduces recovery time. As technology continues to advance, tumor resection using computer-assisted navigation is likely to become the gold standard for surgical management.

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