

CASE REPORT

Lesson Learned from Rehabilitation Medicine Point of View for A Male Patient After Total Right Scapulectomy

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ABSTRACT

Introduction: Chondrosarcoma is a rare cancer about 2 million inhabitants/year. Scapula is the most common location. Total scapulectomy can cause loss of many functions in shoulder movement that affects impaired upper extremity function.

Case Report: A case presentation of 41 years old man, after total right scapulectomy caused by chondrosarcoma. The patient complained of difficulty raising right upper arm, he has limited range of motion in all right shoulder movement. Functional assessment showed disability in overhead activities and affected his vocational as an online driver. Comprehensive rehabilitation program was given, in 2 months follow up patient can return to work and do overhead activities with modification.

Conclusion: Rehabilitation can improve the function in patient after scapulectomy, rehabilitation program depends on the type of surgery and muscle remaining.

Keywords: Scapulectomy, chondrosarcoma, rehabilitation

ABSTRAK

Pendahuluan: Chondrosarcoma adalah kanker yang jarang terjadi dengan tingkat insiden sekitar 2 juta penduduk/tahun. Skapula adalah lokasi tersering. Total skapulektomi dapat menyebabkan hilangnya fungsi pada pergerakan bahu yang berdampak pada fungsi ekstremitas atas.

Laporan Kasus: Seorang laki-laki, 41 tahun paska menjalani total skapulektomi kanan dikarenakan chondrosarcoma. Pasien mengeluh sulit untuk mengangkat tangan kanannya ke atas, terdapat keterbatasan lingkup gerak sendi bahu yang mempengaruhi pekerjaannya sebagai ojek online. Pasien diberikan program rehabilitasi komprehensif, dalam 2 bulan pasien dapat kembali bekerja dan melakukan aktivitas atas kepala dengan modifikasi.

Kesimpulan: Rehabilitasi dapat memperbaiki fungsi pada pasien setelah skapulektomi tergantung dari tipe operasi dan otot yang tersisa.

Kata kunci: skapulektomi, chondrosarcoma, rehabilitasi

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INTRODUCTION

The scapula has interesting role in upper extremity function. Understanding of the shoulder and surrounding structures has improved, that the scapula plays complex roles in shoulder function. Efficient movement of the shoulder is produce when scapulohumeral anatomy and biomechanics work together.¹ The scapula provides a stable base for glenohumeral movement. Coordinated activity of the

surrounding musculature determine the stability of the scapulothoracic joint.^{1,2}

Scapula is the most common location of involvement chondrosarcoma, followed by the proximal femur and proximal humerus.³ Chondrosarcoma is a bone sarcoma, primary cancer composed of cells derived from transformed cells that produce cartilage. Chondrosarcoma is one of the rare cancers with an age standard incidence rate (IR) of about 2 million people/year. Although the prognosis of patients with chondrosarcoma is good, approximately 6% of the patients have distant metastases at the time of diagnosis and approximately 25% have local recurrence.⁴ The key treatment for chondrosarcoma is resection, because this tumor is resistant to chemotherapy and radiotherapy.^{3,5}

Type of surgery based on the size and soft tissues which the bone cancer has spread.⁶ Physiatrist should adapt the rehabilitation program based

on the surgical technique used. Scapulectomy can cause loss of many functions in shoulder movement that affect impaired upper extremity function.⁷

We present a case report of a total right scapulectomy caused by chondrosarcoma. The challenge in the rehabilitation of this patient is no definite rehabilitation protocol after scapulectomy procedure and in each surgery has different results on the remaining muscle. Clinical outcomes and range of motion have been reported in previous studies, but few have analyzed rehabilitation programs.

CASE DESCRIPTION

Male patient, 41 years old, online driver, complained about difficulty to raise right upper arm since 2 months ago after undergo removal tumor and shoulder blade surgery. Patient could only elevate his right upper arm slightly. He also feels easily sore in his right upper arm when he uses right arm to lift heavy load or when he rides motorcycle for more than 20 minutes and disappeared when rested. No tingling and numbness. The condition makes him difficult to do the overhead activities like wearing t-shirt and taking items in high cabinets. Two months after surgery patient has not returned to work as online driver.

Right hand is his dominant, but after surgery patient more often used his left hand. Patient had a mass the size of a marble in his right shoulder since he was 2 months old. Since 5 years ago the mass is felt to be enlarged. 10 months ago patient felt pain (NRS 5) in the mass, the size of the mass is the same as a soccer ball. From

x-ray shoulder and biopsy procedure, he was diagnosed with chondrosarcoma. 2 months ago patient underwent limb salvage and scapulectomy, hospitalized for 7 days, without complications.

Physical examination was shown normal vital signs, body mass index is overweight. Musculoskeletal examination show limited range of motion on the right shoulder. Shoulder flexion 0-50°, shoulder extension 0-20°, shoulder abduction 0-30°, external rotation 0-15°, internal rotation 0-70° (figure 1). Muscle strength of shoulder flexion, extension, abduction, adduction, and internal rotation was grade 4 and external rotation was grade 2.



Figure 1. Limited in shoulder range of motion

He had good hand function on power and prehension. Decrease 10% sensibility on right axillary nerve. Barthel index 19/20 impaired in upper dressing, disabilities of the arm shoulder and hand 22/150. The International Classification of Functioning, Disability and Health (ICF) was described (figure 2).

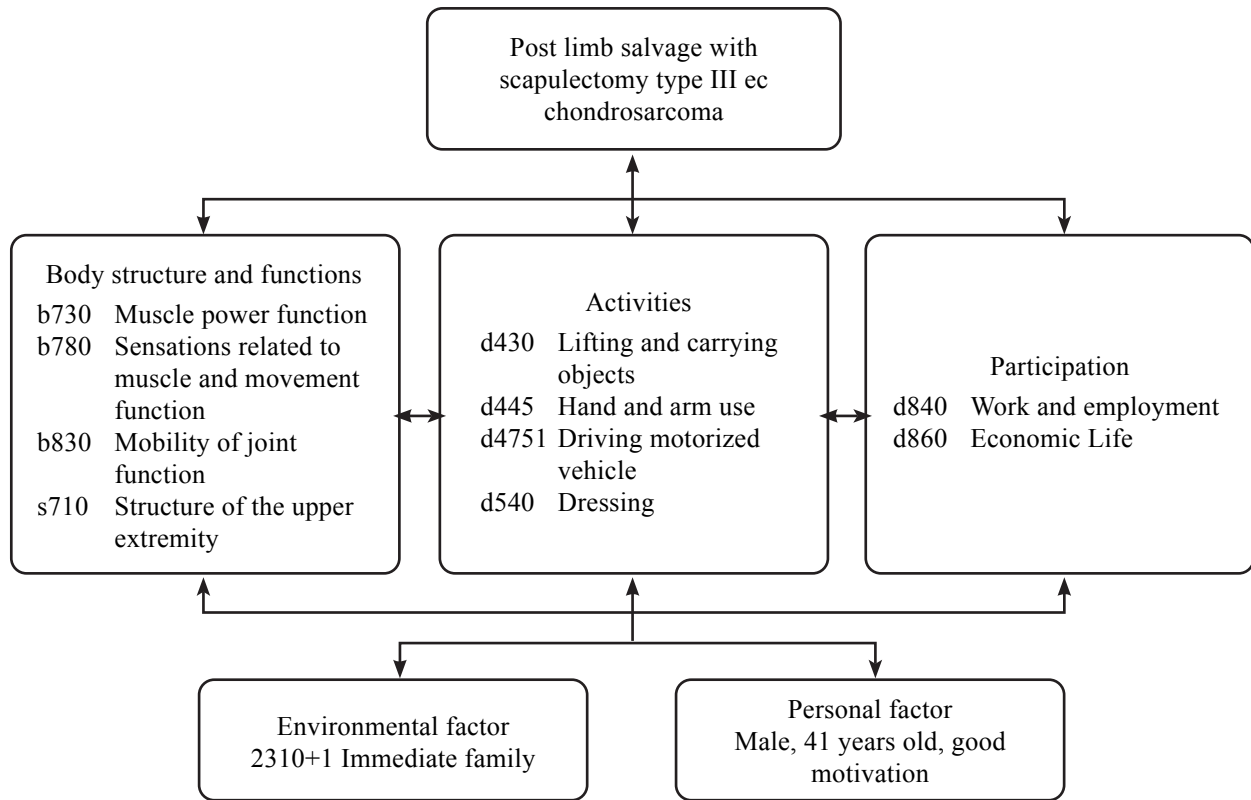


Figure 2. International Classification of Functioning, Disability and Health (ICF) application in this case management

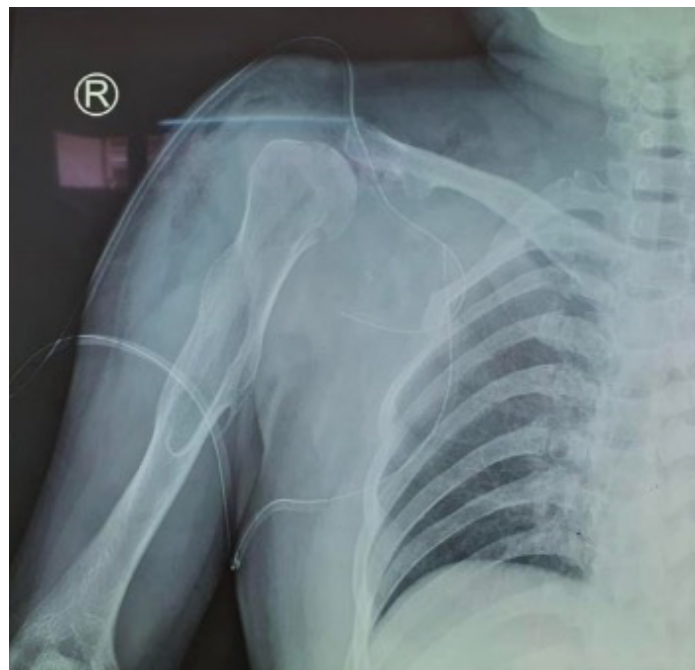


Figure 3. X-ray right shoulder

X-ray right shoulder post-surgery (figure 3) showed no visualization of scapula, well-defined exophytic and lytic lesions on the proximal 1/3 of the right humerus suggested osteochondroma.

Tumor biopsy result was grade 1 chondrosarcoma. Surgery report showed that surgeons did total scapulectomy type 3 and Limb-sparing surgery procedure, removed the right scapula, supraspinatus, infraspinatus, teres minor, subscapularis, deltoid posterior and half of teres major. And others muscle that has origo or insertion in the scapula serratus anterior, rhomboid, levator scapula, lower trapezius was being myoplasty and myodesis, attached to proximal humerus.

Patient was managed with rehabilitation program. The goal of rehabilitation program in this patient was to maintain range of motion, maintain muscle strength and improve endurance of remaining muscle. Rehabilitation program of this patient is flexibility exercise (right shoulder flexion, abduction, external rotation pasif, maximal 90° and stabilization at clavícula), strengthening isometric exercise (right shoulder flexor, abductor, external rotator), hand functional task exercise about how to improvise overhead movements using his remaining muscle to make it effective and education not to lift heavy objects using right hand.

In the 2 months follow-up patient had increased range of motion in shoulder extension become 0-40° and external rotation become 0-20°. Patient can return to work as online driver and do overhead activities with modification.

DISCUSSION

The patient was diagnosed with post limb salvage and scapulectomy caused by secondary chondrosarcoma associated multiple exostoses. The chief complaint of the patient is difficulty raising his right upper arm. Post scapulectomy is a rare case so it is interesting to discuss the functional and rehabilitation management.

The patient underwent total scapulectomy type 3 and Limb-sparing surgery procedure, which removes the tumor without removing (amputating) the whole arm (the limb). Surgeons remove all of the tumors and soft tissues where bone cancer has spread. In this case, the surgeons removed the right scapula, supraspinatus, infraspinatus, teres minor, subscapularis, deltoid posterior, and half of the teres major. Muscles that have origin and insertion in the scapula such as serratus anterior, rhomboid, levator scapula, and lower trapezius were myoplasty and myodesis and attached to the proximal humerus.

This patient only could do active abduction in 0-30°, the supraspinatus, infraspinatus and subscapularis have been resected, the only remaining muscle for primary abduction is middle deltoid. For the prime mover of shoulder flexion, anterior deltoid, coracobrachialis, and long head of the biceps brachii are intact. Serratus anterior and trapezius are intact but without scapula can make instability in shoulder complex and will not make the full range of motion. An important function of the rotator cuff muscle is to compensate for the natural laxity and tendency toward instability of the glenohumeral joint. Rotator cuff muscles are already resected, so it can cause instability, loss of rotator cuff forces.⁸

The major muscles that internally rotate the glenohumeral joint are the subscapularis, anterior deltoid, pectoralis major, latissimus dorsi, and teres major. The primary muscles that externally rotate the glenohumeral joint are the infraspinatus, teres minor, and posterior deltoid. The external rotators has relatively small proportion of the total muscle mass in the shoulder. Therefore, the external rotators produce the least amount of torque with maximum effort of all shoulder muscle groups. This patient could do full range of motion of internal rotation because most of the internal rotator is intact, for the external rotation he can do 0-15° and has manual muscle testing grade 2, all the prime mover of external rotators that have already been resected can perform this movement with the support of the internal rotators, as many of the internal rotators are also strong extensors and adductors.⁸

Limited range of motion and muscle weakness caused by scapulectomy and muscle resection procedure. The shoulder complex consists of a set of four articulations involving the sternum, clavicle, ribs, scapula, and humerus. Shoulder muscles work together to produce coordinated actions that are expressed across joints.⁶ No scapula can affect many functions. The patient lost scapular humeral rhythm so the patient has difficulty elevating his shoulder.⁷

The patient also lost some function of joints. Acromioclavicular joint is kinesiology important for optimizing movement and alignment between the scapula and thorax. Scapulothoracic joint is formed by the interaction between the sternoclavicular and the acromioclavicular joints, limitation of movement in one joint can significantly limit the movement of the scapula, and ultimately the entire shoulder.⁸

The scapula is the place for attachment of some muscles (figure.4)⁸. no scapula causes remain muscle loss of attachment. Remain muscles have been subjected myodesis and myoplasty, it can alter the length-tension relationship of the muscles.

Shoulder muscles are not work separately but mostly work synergistically to increase their control over several joints in the region. Most of the muscle groups in the shoulder complex belong to one of the most respected categories: proximal stabilizers or distal mobilizers.⁸ The proximal stabilizers are muscles that arise from the spine, ribs, and skull and attach to the scapula and clavicle, examples are serratus anterior and trapezius. Distal mobilizers are muscles that originate from the scapula and clavicle and attach to the humerus or forearm, examples are the deltoid muscle and the biceps brachii.⁹

Raising the arm through flexion is accomplished primarily through the anterior deltoid, coracobrachialis, and long head of the biceps brachii. In shoulder abduction, the strong lines of the middle deltoid and supraspinatus are similar. Both muscles are activated at the start of the lift and are maximally abducted near 90°. The deltoid and the supraspinatus muscles contribute about equal shares of the total abduction torque at the glenohumeral joint, if the supraspinatus is resected, complete abduction is often difficult because of the altered arthrokinematics at the glenohumeral joint. The serratus anterior muscle also works throughout the entire range of shoulder abduction. Serratus anterior and trapezius play a role in control upward rotation of the scapula, during arm elevation.⁸

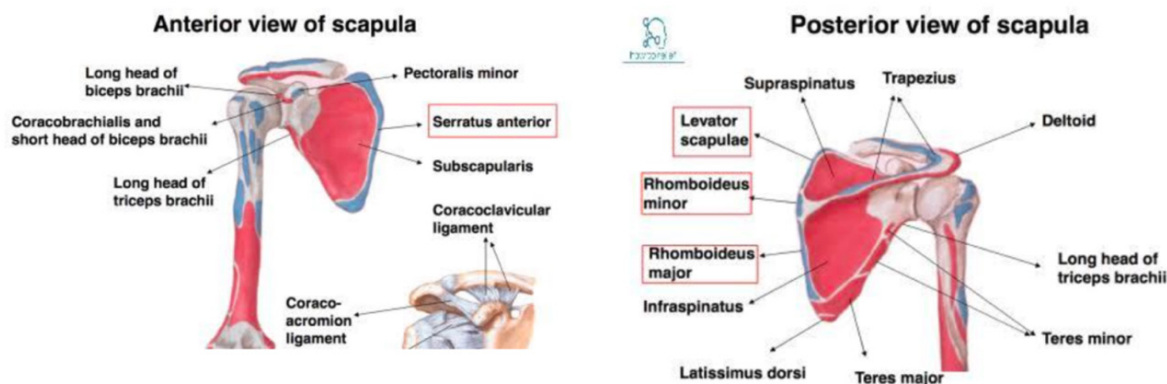


Figure 4. Attachment muscle on scapula

The remaining function of the affected limb tends to be minimal and unsatisfactory. Although various rehabilitation techniques have been developed after total scapulectomy, the optimal rehabilitation techniques have not yet been determined because it is difficult to compare the different techniques because the amount of remaining muscle and rotator cuff damage varies after each procedure.¹⁰

Clinical outcomes and range of motions have been reported in previous studies, but few have analyzed rehabilitation programs. Vitale et al 2009, reported after major shoulder resections (scapulectomy, humeral resection, and classic Tikhoff-Linberg procedure) patients had reduced shoulder range of motion, especially abduction and flexion above 90°. Range of motion of the elbow and hand is usually normal (unless the peripheral nerves are affected by tumor or surgery). Despite the significant range of motion limitation, good pain control and good fine motor hand function led to good overall results.¹⁰ This is same as the functional result in this patient, he has limited shoulder range of motion, but is normal in elbow and hand.

Uematsu et al 1979, reported after total scapulectomy or Tikhoff-Linberg (total shoulder girdle resection) procedures have good pain relief.¹¹ No pain in this patient, but he complained about easily feeling soreness in his right upper arm when riding motorcycle more than 20 minutes, soreness disappeared when he rested his arm, in this condition occurs muscle overuse. When riding motorcycle the right arm is in static position to hold the gas and handlebar of motorcycle, in this position patient needs shoulder stabilization, but as mentioned above the shoulder complex of this patient was disrupted. Hence, the remaining muscle must work more to compensate the muscle loss.

Grade 1 chondrosarcoma grade 1 has a 97% 5-year survival rate. 10-year local recurrence-free survival was 83%.¹² Functional prognosis in activity daily living and instrumental activity daily living is independent, return to work with certain limitations and modifications for overhead activity.

The goal of rehabilitation program in this patient is to maintain range of motion, maintain muscle strength and improve the endurance of remaining

muscle. From a previous study shoulder range of motion exercise can be given after the surgical site has healed, anywhere from 2 to 4 weeks postoperative and limited forward flexion and abduction to 0-90°. Strengthening exercise could be allowed after 4 to 6 weeks postoperative.¹⁰

Patient came to Physical Medicine and Rehabilitation Department in 2 months post operative, we give flexibility exercise of right shoulder flexion, abduction, external rotation passive, maximal 90° stabilization at right clavicle and strengthening isometric right flexor, abductor, external rotator shoulder, educational program about chondrosarcoma and risk factor and prevents complications to not lifting a heavy object with right hand. After total scapulectomy, humerus only articulates with a free-floating glenoid or none, if axial load is applied it could easily injure surrounding structures.¹¹

For the return to work program, the goal is to no soreness, increase muscle endurance and return to his current job with certain limitations. We give exercise in occupational therapy for endurance exercise in right upper extremity, hand functional task exercise about the way to do improvise overhead movements using his remaining muscle to make it effective and education not to lift heavy objects using right hand. Patient after total scapulectomy can lift weight maximal 9 kg in the affected arm, considering he is an online driver that should accept delivery of goods, he should be taught to perform improvised movements by compensating his muscle (using remaining muscles) to make the work effective and safe.

CONCLUSION

Scapulectomy can cause loss of many functions in shoulder movement that affects impaired upper extremity function, rehabilitation after scapulectomy depends on the type of surgery and the type of muscle remaining. With the overall program in 2 months follow up patient can return to work and do overhead activities with modification.

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