

Progresses on the management of swimmer's shoulder

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Abstract. Swimmer's shoulder frequently happens on the swimmers which is the reason why it is named after it. However, it also occurs to people who overload their shoulders via over the head motion. We need to pay attention to this injury due to the after effect on the body as the injury worsens. This is a report summarizing the introduction, anatomy of the shoulder, diagnostic, treatment, prevention of swimmer's shoulder injury. Besides, swimmer's shoulder happens mostly on the swimmers, but it worth to mention that it also occurs to people who overload shoulder with over the head motions.

Keywords: swimmer's shoulder, neer's test.

1. Introduction

Swimmer's shoulder also known as shoulder impingement or subacromial impingement or painful arc is caused due to overuse of the shoulder joint by repetitive motion such as overhead to cause the inflammation or tear. Thus, the injury is named after swimming as it is most commonly seen in the athletes who do competitive swimming which is also known as the one of the sports that aggravates the shoulder by constant joint rotation. Additionally, shoulder pain is the third common complaint from the patient, thus it should be observed carefully [1].

According to the research conducted by Stef Feijen et, al, to find which age groups get the shoulder injury the most showed that the adolescent swimmer who are aged between 15-17 years old recorded 91.3% which is the highest amongst the others who are young (<15 years), adult (18–22 years), and masters (23–77 years) [2]. Although this shows that adolescence has the highest rate for swimmer's shoulder, the rate will differ depending on the amount of training swimmers do per week because it was also shown in the research that adolescent swimmers do the most training amongst the others as well. Therefore, it is not fully sure if the age group matters for people to get swimmer's shoulder.

Furthermore, swimmer's shoulders can be quite subjective as it is easy to manipulate people to think that only swimmers can get this injury yet this can occur to anyone who does the overhead motion or constant lift motion. Additionally, it is not transferable as it is not caused by bacteria or virus. However, the percentage of getting a swimmer's shoulder can depend on the family history of the person as it can be genetically passed down the generation.

2. Anatomy of swimmer's shoulder

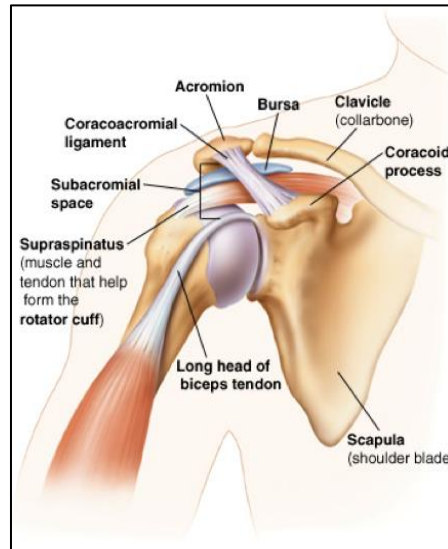


Figure 1. Shoulder anatomy near the glenohumeral joint structured [3].

To look through further, a swimmer's shoulder occurs at the front of the shoulder and gradually develops along the side of the shoulder joint. It mainly occurs at subacromial impingement including the rotator cuff tendon, bicipital tendon, or subacromial bursa [4]. In swimming, it is usual for flexion to go more than 180 degrees or extension to go beyond 60 degrees. Each of these movements done daily easier inflames the muscles and ligaments around the joint which are glenohumeral joints-comprising two bones: the humerus, the humeral head, and the scapula, the glenoid fossa.

Surrounding the glenohumeral joint there are 4 muscles (Figure 1). Supraspinatus helps to withstand the gravitational force acting on the shoulder joint and keeps the head of the humerus against the glenoid fossa for stabilization. Another example is infraspinatus. It helps to assist in external rotation. Then, it is teres minor which helps to hold the humeral head into the shallow glenoid cavity of the scapula. Furthermore, the subscapularis helps the internal rotation as well as adjusting the humerus. These joints and muscles are important because the shoulder plays an essential role in our daily life, such as when stretching the hand for something high or in sports, and also in studying.

Swimmer's shoulder occurs due to poor technique, over-training, fatigue, previous shoulder injury, hypermobility, unfit paddles for hand. Leaving the swimmer's shoulder without any treatment may lead to certain injuries such as rotator cuff tear-the ligament tears from the bone, damage on capsule, tendonitis and rotator cuff impingement, and bursitis-inflammation of a closed, fluid-filled sac called a bursa, which serves as a cushion and gliding surface to lessen friction between bodily parts [4]. And the mechanism of the swimmer's shoulder is usually described as subacromial impingement including the rotator cuff tendon, bicipital tendon and subacromial bursa (Figure 2).

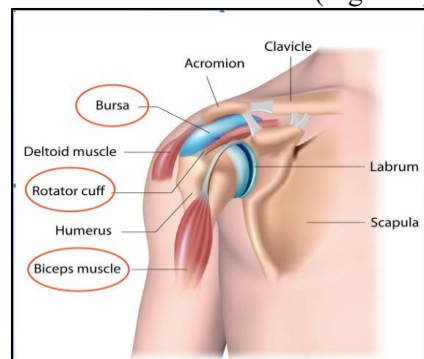


Figure 2. Mechanism of the swimmer's shoulder [4].

3. Diagnostic

The common sign of the swimmer's shoulder is when the pain that is firmly embedded in the muscles is felt spreading along the back of the shoulder or occasional pain along the front of the arm. In addition, the symptoms for swimmer's shoulder can be limited motion in the shoulder compared to before or other shoulder, increased joint laxity and reduced power [5].

In order to find whether the person is positive or negative for the swimmer's shoulder, there are three diagnoses that are recommended. The first diagnostic is palpation where the doctors use their hands or fingers to press against the body parts to physically examine the cause. This is used to detect the tenderness which is to find where the pain and abnormal where the doctor can find if the shoulder is inflamed or dislocated.

Table 1. Pros and cons about palpation.

Pros for palpation	Cons for palpation
Quick to examine Affordable for everyone as no extra fees It is widely used by the doctors before going to further diagnosis	Unable to identify the specific cause Only a prediction May suggest wrong treatment

Secondly, neer's test is used specifically for people who have shoulder pain. It is used to determine whether the shoulder pain is caused by an impingement which limits the range of motion done by the shoulder.

Table 2. Pros and cons about neer's test.

Pros for neer's test	Cons for neer's test
Affordable for everyone Less-time consuming Can be done individually	Prediction done by the reaction of the patient Sensitivity and specificity of 79% and 53% [6] May not able to find the tear before the inflammation

Thirdly, there is a magnetic resonance image (MRI) where the doctor uses radiology to form pictures of the inner structure such as tissues. This is used for further details when the patient tested positive for either palpation or neer's test and wants further detail about the injury.

Table 3. Pros and cons about MRI.

Pros for MRI	Cons for MRI
Clear image Better decision making Less mistakes	Too expensive Time-consuming Repeatedly testing may affect the body due to ionization

Therefore, there are both many advantages and disadvantages for these diagnoses. Overall, neer's test is the most recommended among the all because it is specialized for identifying the positive or negative of shoulder pain caused by an impingement.

4. Treatment

There are several treatments to treat swimmer's shoulder. The first treatment is to put ice on the shoulder for around 20 minutes. The use of ice on the shoulder will constrict blood vessels and decrease circulation to the area which helps to keep swelling down. This is a simple method, which is affordable

without any problem. However, it only works in a short period of time as it only helps to keep the swelling down which means it will not completely cure the injury and it is only guaranteed to get better for a short period of time.

Second treatment is anti-inflammatory medication consumed several days post-injuries to constrain the inflammatory responses. There are many theories regarding this such as according to Better Health, they believe NSAIDs are used to block a specific enzyme, cyclooxygenase which is used to make prostaglandins used by the body. However, some medicine may not work at all but be manipulative to certain people such as giving them feeling relaxed or comfortable by consuming the medicine. The advantage is that it can be quite useful to keep the pain down for a short period of time quickly. On the other hand, the effects for treating the inflammation is not fully guaranteed for the people.

The third treatment is by medical machines such as interferential current, ultrasound, trigger point work, cross friction tendon massage, adjustments to the neck and shoulder and post-isometric relaxation of the muscles involved [5].

Table 4. Types of treatment done by medical machines.

Name	Description & pros and cons
Interferential current	Forward little amount of electrical stimulation to the damaged tissues in the body. It is used to improve blood flow and hormone production that aid in healing, as well as the body's natural response to pain [7]. The pro is that it lets go of endorphins to improve recovery which increases the blood circulation for the certain area to improve the healing process by the body. There are no cons for this treatment right now.
Ultrasound	Ultrasound is used to find the address of the musculoskeletal problems such as pain, tissue damage. It also helps to reduce the pain, better blood circulation and tissue healing. The pro is that it does not produce radiation which means it does not cause cancer due to the ionizing effect.
Trigger point work	Trigger point work is a treatment that requires a soft tissue technique that reduces the pain, tension in the muscles and fascia which is a knot in the muscle. The pro for this treatment is that it reduces pains to improve flexibility and widen the range of motions. However, it gives sluggishness for several days after the treatment because the body is trying to heal.
Cross friction tendon massage	Cross friction massage uses fingers to massage the scar in a direction that is perpendicular to the line of the scar. The goal for this treatment is to relieve pain, increase blood flow and break up the scar tissues. The pro is that it increases mobility and healing by preventing the tissues from sticking together [7]. The con is that frequent massage is required as it only works for a short period of time.
Adjustments to the neck or shoulder	It is a simple stretch and massage to adjust the position of the neck and shoulder for better posture. The pro is that it can be done without any instructor and it is the cheapest among all. The con is that it might not be as effective as other treatments.
Post-isometric relaxation of the muscles involved	It is to place the muscle in a relaxed/ stretched position. This helps the body to untighten the muscles and relax. The advantage is that it is affordable by anyone. However, it is not as effective as going to a physical therapist and done by the professionals.

The fourth treatment is rehabilitation/physical therapy. The rehabilitation is used to weaken the tightened muscles and strengthen it.

This is an exercise that is commonly suggested for people who have a swimmer's shoulder. It uses resistance bands to strengthen the muscles. It is done by holding the resistance band while banding the elbow to 90 degrees, holding it beside the body and slowly internal and external rotation, repeating a few times [8]. The pro for rehab is that it prevents costly hospitalization, avoiding long stay in hospital. The con is that it depends on how much commitment the patient has as more rehab they do, the better the pain will be reduced.

Last but not least, improving the way to swim can be a treatment as well. This is also suggested to prevent the swimmer's shoulder from occurring. Firstly, the patient should check whether their equipment suits their body or not. Using suited equipment for the body can give less pressure to the body and recover the shoulder. Secondly, discussion with the coach regarding the current technique can help find out what was the main problem that caused the pain. The advantage is that it stops further progression of the pain but it will not relieve the pain unless rehab or medicines are taken.

5. Prevention

For prevention, the stretches are the most recommended. And to prevent swimmer's shoulder, the first stretch is shoulder external rotators.

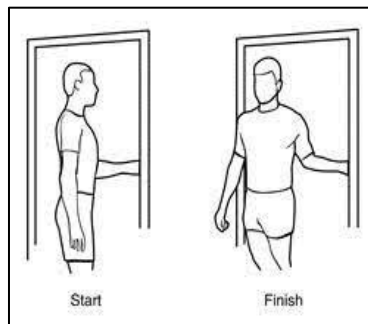


Figure 3. Stretch for the shoulder external rotation.

It is done by standing beside any walls and bent the elbow 90 degrees putting them by the side of the body. Rotator the body forwards while not moving the position of the elbow. Continue the exercise until the body is fully stretched. Additionally, although there are more different stretches to do shoulder external rotators, this exercise is most recommended as this takes short time and is easy to do without any equipment. This exercise specifically focuses on the infraspinatus muscle that is located near the glenohumeral joint for external rotation support.

The second exercise is pec major stretch. This helps the patient for better posture and increases the mobility of the shoulder and spine.

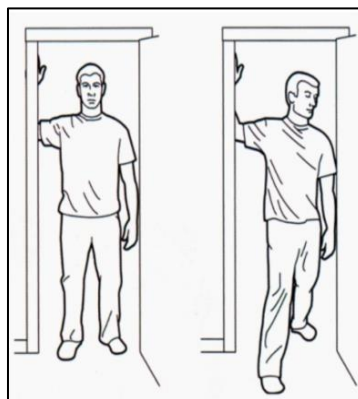


Figure 4. Stretch for pec major.

Firstly, find a wall and raise the arm up until it is perpendicular to the shoulder. Then, bend the elbow to 90 degrees, softly placing it on the wall. Put one foot in the front, slowly rotating the chest to the

opposite side of the arm. If the stretch is felt by the patient, the exercise is done correctly. This stretches the pectoral muscles in the chest and makes the chest open up more [9]. The last exercise is thoracic spine mobility which is to extend, spin, and laterally flex to bend and round forward.



Figure 5. Thoracic spine mobility stretch.

Find an object that is not too high and too low from shoulder. Place both hands on the object at shoulder length and slowly walk backwards to bend yourself down. When shoulder is at the same level of the object, put the head down to further push the body down opening the chest. This is done to achieve better posture and prevent the pain. Spinal erectors, rhomboids and middle trapezius are the muscles involved in the stretch [9].

In a nutshell, these stretches all have different purposes for the body and muscles, so doing all of them will help the swimmers to prevent getting the swimmer's shoulder. However, the patient needs to be motivated to do the exercise as it needs to be done by themselves. Furthermore, there are not guaranteed method that neither control the pain nor fast recovery [10].

6. Conclusion

In conclusion, a swimmer's shoulder is a common injury that occurs at anyone at any age group regardless of gender. However, people aged around 15-17 have a higher chance of getting swimmer's shoulder due to the amount of training they do compared to others. For the treatments, there are countless numbers of them but it depends on what the doctor suggests as some may suit the patient and some may not. Additionally, each treatment works with a different level of swimmer's shoulder. For instance, if the patient just started feeling the pain, they can just apply the ice to see the progression. Usually, surgery is not suggested for swimmer's shoulder, thus the patient may need to continue the treatment for a long period of time compared to other injuries such as rotator cuff tear. However, with correct stretches, knowing how they will impact the body will decrease the chance for getting swimmer's shoulder so they might be able to avoid the risk of getting hospitalized. Stretching the body frequently can help the patient improve in their performance and flexibility.

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