

A Literature Review On Shorten Pectoralis Minor In Subjects With Subacromial Impingement

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ABSTRACT

BACKGROUND: Subacromial impingement syndrome affects the shoulder and results in disability and functional loss. It is the most common disorder in the shoulder joint. It can happen by various factors i.e., due to weak or dysfunctional rotator cuff musculature or posterior glenohumeral capsule tightness. It is proven that pectoralis minor tightness will reduce the subacromial space in turn leading to the subacromial impingement. Patients with impingement seen decreased upward rotation decreased posterior tipping, and increased internal rotation of scapula during arm abduction movement. Research says pectoralis minor tightness is also one of the causes of altered Scapular kinematics.

AIM: To review the relevant articles which discuss the pectoralis minor tightness in subacromial impingement in turn changing the kinematics of scapula.

SEARCH METHOD: PubMed, Google scholar, Pedro, Research gate, science direct, and Cochrane from these databases articles were searched. By using the keywords 43 articles were collected from the past 20 years.

SELECTION CRITERIA: Selection criteria include the articles focusing on pectoralis minor tightness and subacromial impingement are only included in the study.

RESULTS: These ten articles were based on the inclusion criteria and all the articles were stating that when compared with the normal healthy shoulder individuals as measured with pectoralis minor length the subacromial impingement patient's pectoralis minor length is shorter and shown with altered scapular kinematics. The short pectoralis minor may be for various reasons rounded shoulder is also one of the reasons.

CONCLUSION: In this literature review we are concluding that pectoralis minor tightness or shortening is one adding a mechanism for subacromial impingement and this pectoralis minor tightening is affecting the free movement of the scapula for upward rotation and tilting of scapula anteriorly and internally rotated. However, this current evidence is limited and more RCT can be performed on the prevalence of pectoralis minor tightness in subacromial impingement patients. Thus, with the limited available evidence, it is not possible to offer clear evidence-based recommendations.

KEYWORDS: subacromial impingement, shoulder impingement, shoulder disorders, pectoralis minor length, pectoralis minor shortening, subacromial space, encroachment, and impingement syndrome.

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I. Introduction

Narrowing of subacromial space which leads to encroachment of subacromial tissues is known as Subacromial impingement. Comparing to other disorders SAIS is commonly seen in 44-65% of cases coming with a complaint of shoulder pain.²Subacromial space is the hallow space present with the surrounding structures like coracoid process, acromion process (ant 2/3rd), superior surface of the head of the humerus, and coracoacromial ligament.²

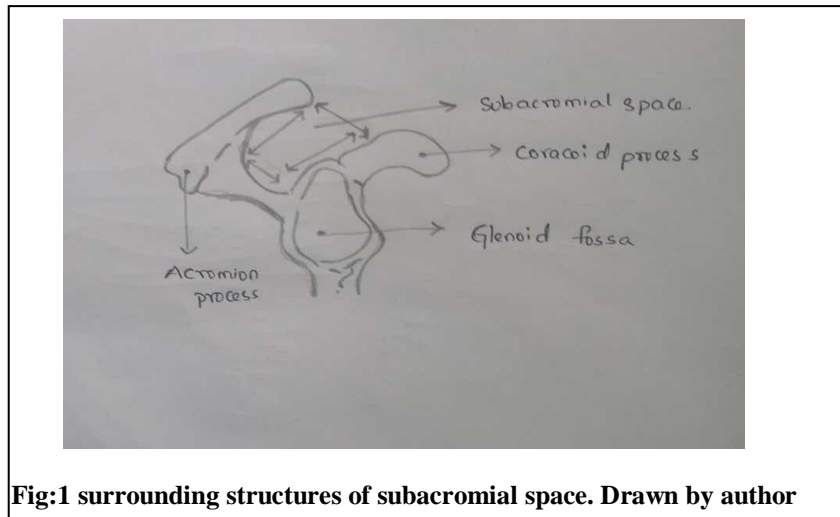


Fig:1 surrounding structures of subacromial space. Drawn by author

The space ranges from 1.0 to 1.5 CM. The structures present in the subacromial space: Tendons of the rotator cuff (SAIS), GH capsule, Coracoacromial ligament, Tendon of the long head of Biceps brachii, and Coracoacromial arch.³

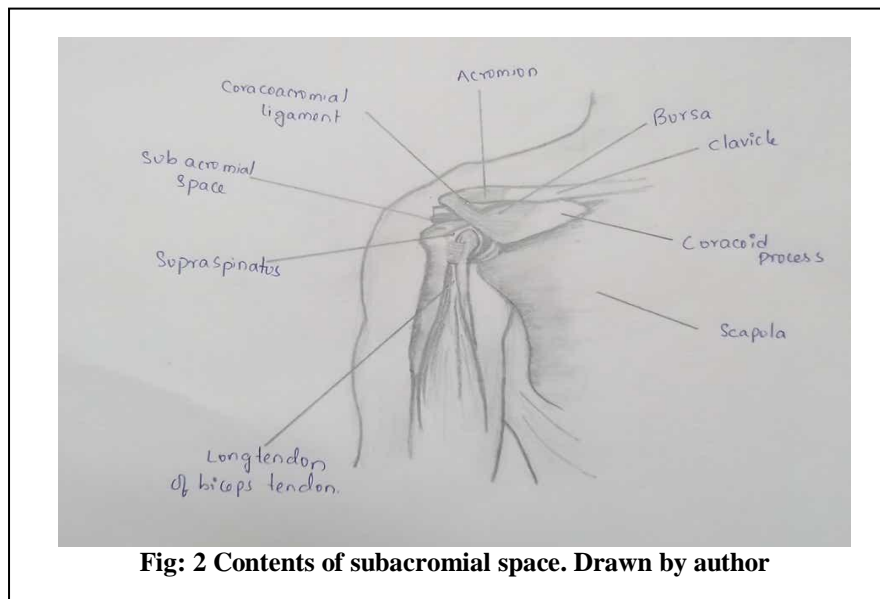
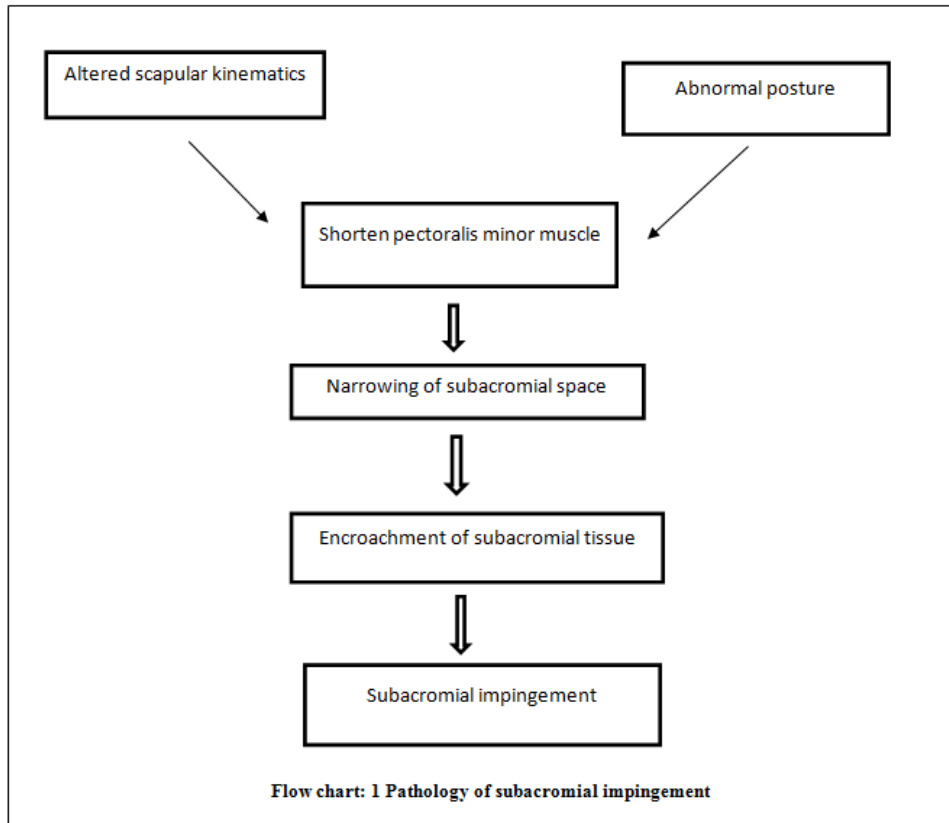


Fig: 2 Contents of subacromial space. Drawn by author

There are generally two types of subacromial impingement: structural and functional. Physical loss of space due to bone growth which reduce the subacromial space leads to structural impingement, Gleno-humeral instability and muscle imbalance of shoulder and scapular muscles will leads to altered scapular kinematics, this indirectly affects the narrowing of the subacromial space which can cause functional impingement.⁴

Pectoralis minor muscle originates from the anterior 3rd, 4th and 5th ribs near to costal cartilage and is inserted in the medial border of the scapula at the upper surface of the coracoid process. The function of the pectoralis minor is downward rotation, protraction, and depression of the scapula. If the pectoralis minor muscle gets shorten/tighten it will tilt the scapula anteriorly, therefore, scapula kinematics will differ leading to subacromial space narrowing.⁶

It is commonly experienced by the patients with subacromial impingement, Since the insertion of pectoralis minor is at the 2/3rd of the coracoid process of the scapula which is one of the major structures forming subacromial space any alterations of pectoralis minor will leads to the structure of subacromial space. To achieve this aim the review was conducted to know various available literature articles on tight/shortness of pectoralis minor in subacromial impingement.



II. METHODOLOGY

STUDY DESIGN

SEARCH METHOD AND ELIGIBILITY CRITERIA

An extensive literature search was done, the search engines used were PubMed, google scholar, Medline, and Pedro. Based on the available study there is pectoralis minor tightness in subacromial impingement. Keywords used are pectoralis minor tightness, subacromial impingement, subacromial space, kinematics of subacromial impingement, and posture alignment of the scapula. The articles focusing on pectoralis minor tightness and subacromial impingement are only included in the study and the articles which were not published in the English language were excluded.

SAMPLE SIZE

A sample size of 33 articles was searched with the keywords of pectoralis minor tightness, subacromial impingement, subacromial space, kinematics of subacromial impingement, and posture alignment of the scapula. Out of these articles, papers obeying the inclusion and exclusion criteria are filtered and finally, 10 articles were obtained for the review.

INCLUSION CRITERIA

- Articles explaining subacromial impingement with pectoralis minor shortening were included.
- Articles published in recent years.
- Full-text articles.
- Articles published in English.

EXCLUSION CRITERIA

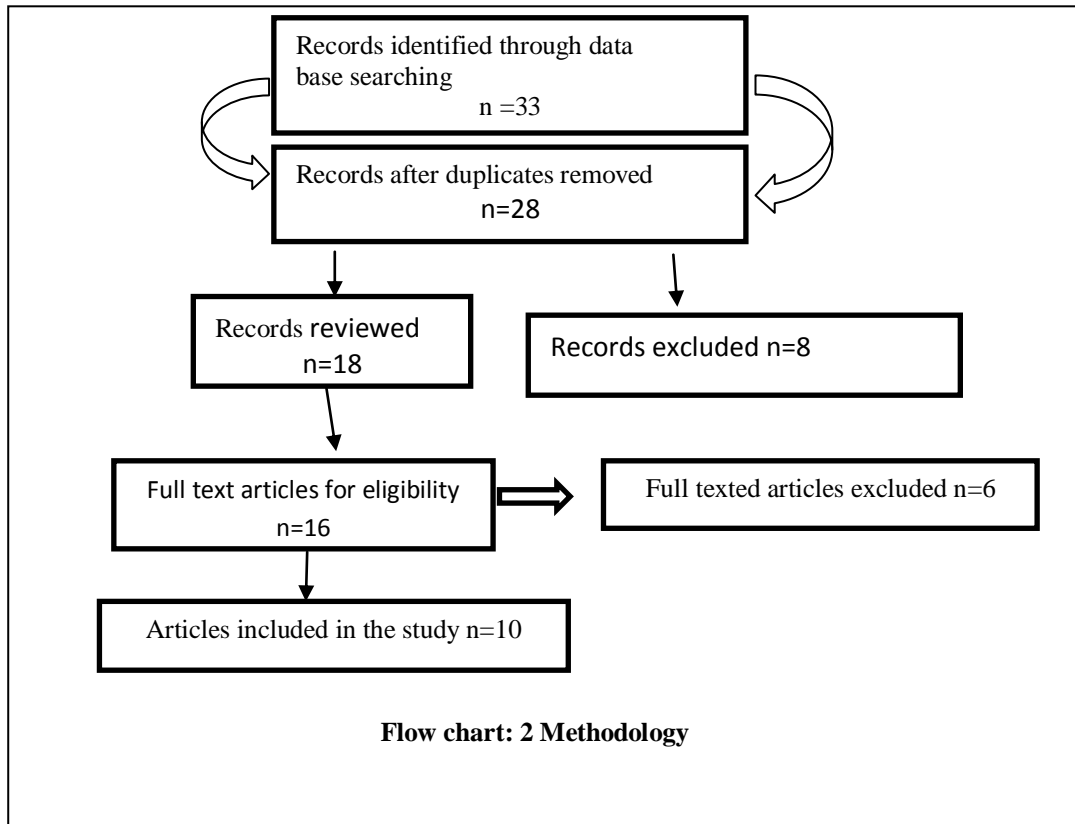
- Articles of past 2003
- Articles explaining surgical interventions.
- Articles discuss short pectoralis minor muscle in other conditions of the shoulder.

SELECTION OF INCLUSION AND EXCLUSION CRITERIA

Based on the inclusion and exclusion criteria 10 were selected and reviewed. All the articles were published between 2003-and 2020 we should not include the past years of 2003 because the recent articles will be having

good explanations as compared with the past ones. All the articles were discussing the subacromial impingement related to shortening pectoralis minor because there are various mechanisms for the subacromial impingement for that our review article will be discussing only the shortening pectoralis minor and its mechanism for the subacromial space narrowing. All the articles were in the English language because it will be easy to understand and analyze the data, non-English articles may lead to improper results because of lack of understanding. Only full-text articles were included because with only an abstract it will be a partially completed study of the articles. If it is full-text articles then-unknown facts may also be found.

FLOW CHART



III. SUMMARY OF ARTICLES

S.NO	AUTHOR	PUBLISHED YEAR	REMARKS
1.	N. Priyanka	2021	A prospective study with 64 subjects to know the effectiveness of MFR and MET on pectoralis minor length is variation in patients with SIS. They concluded that the pectoralis minor length is altered by increasing the anterior tilt and internal rotation mechanically decreasing the subacromial space. After 6-week intervention programs for 2 groups MET + convention therapy group is more effective than MFR + convention therapy group. This study suggested MET group increases the length of pectoralis minor muscle length thereby increasing the subacromial space. ⁷
2.	Elif Torgut	2017	An observational study to see effects of stretching on tight pectoralis minor and posterior capsule in SIS. It concluded that there was decreased tightness of pectoralis minor and posterior capsule and less pain severity in patients with SIS during activity and they recommended including the stretching program in an early shoulder rehab program. ⁸
3.	Ratcliffe	2014	A systematic review conducted to know the relation between subacromial impingement syndrome and scapular kinematics stated that even though there is no direct effecting factor of scapular kinematics in SIS but decreased scapular retraction, posterior tilting will narrow the subacromial space results in mechanical impingement of the structures present and will be notified as contributing factor for subacromial impingement syndrome. Studies included in this review indicated that tight pectoralis minor muscle will be an adding factor for those kinematic changes in scapula which leads to subacromial impingement. ⁹
4.	Azar Moezy	2014	A randomized clinical trial to compare the effectiveness of scapular stabilization exercise therapy and physical therapy in patients with SIS. 68 patients with SIS were

			randomly allotted into ET and PT groups and pain, shoulder ROM (abduction, external rotation), scapular rotation, and pectoralis minor length were assessed pre and post of intervention. Outcome measures used for pain are VAS for shoulder ROM universal goniometer and pectoralis minor length by anthropometric measurement. They stated with regards to pectoralis minor length scapular dyskinesis leads to pectoralis minor length shortening or tightness cause there is a significant difference in pectoralis minor length in both PT and ET group pectoralis length (PT= 0.23+_0.08 ET 0.46+_0.20 with p-value P<0/001). ¹⁰
5.	Shanna Harrington	2014	A cross-sectional study by the author to examine the shoulder pain and disability in division I female swimmers including 37 female swimmers into the study and pectoralis minor length is measured in both resting and stretched positions using a PALM palpation meter. Here differences were found between the two groups on the dominant side pectoralis muscle length at rest is p=0.003 and stretch is p=0.029. here they described that altered scapular kinematics has been associated with pectoralis minor length shortening. Any scapular dysfunction rather than resting alignment of the scapula is hypothesized to decrease subacromial space. Scapular dysfunction like an increased tilting of the scapula anteriorly and internally rotated. ¹²
6.	Phadke V	2009	The purpose of this paper is to review current knowledge of how muscle activation and force production contribute to shoulder kinematics in healthy subjects and persons with shoulder impingement in all muscles of the shoulder. mention about the short pectoralis minor that exhibits altered scapular kinematic patterns similar to those found in persons with shoulder impingement. ¹³
7.	John D borstad	2006	A comparative study for three stretches to know the better relief of the pectoralis minor tightness. Purpose of the study is to compare the 3 stretches of pectoralis minor for improving SIS. For those 50 subjects were included and pectoralis minor length was measured by Flock-of-Birds electromagnetic motion-capture system. The three stretches were unilateral self-stretch, supine manual stretch, and sitting manual stretch. While comparing unilateral self-stretch gives the greatest length change by 2.24 cm followed by supine manual stretch by 1.69 cm then by sitting manual stretch by 0.77 they mentioned that pectoralis minor shortening in healthy human beings is associated with scapular dysfunction which is the same as the altered scapular mechanics with subacromial impingement. ¹⁴
8.	Labriola JE	2005	In this paper author explained the stability and instability of the shoulder joint. It is further explained that there is a tight /shortened pectoralis minor leading to upward rotation, external rotation, and posterior tilt in the scapula causing a decrease in subacromial space. ¹⁵
9.	John D borstad	2005	Author conducted a two-group comparison study to compare scapular kinematics in both short and long pectoralis minor resting length with comparing normal pectoral minor muscle length 54 volunteers were divided into short and long pectoralis minor groups and they proved that short pectoralis minor group was having scapular kinematics disturbances. And that scapular kinematics disturbances are one of the mechanisms that contribute to the reduction of subacromial space therefore this shortness of pectoralis minor muscle potentially leads to subacromial impingement. ¹¹
10.	Michener LA	2003	Author in his review paper explains the anatomical and biomechanical mechanisms happening in subacromial impingement. Concerning this, he stated that subacromial space will also get narrow when pectoralis minor gets tight shortened and make alterations in scapular kinematics like tilting the scapula anteriorly. ¹⁶

IV. Discussion

This study explains the pectoralis minor shortening in patients with subacromial impingement. Whenever the pectoralis minor muscle gets tight or shortened, the reason may vary like altered scapular kinematics or because the people adapted to abnormal posture.

The normal length of the pectoralis minor length with regards to the Gold Standard method is 2.6 CM. According to Jeremy if the distance between the acromion process and the couch (which is considered the length of the pectoralis minor) is more than 2.6 cm it is considered the short or tight pectoralis minor.¹⁷

The reviewed articles prove that whenever the pectoralis minor gets tight or short then it will directly get impact the subacromial space. This tightness also affects the scapular kinematic. Majorly it will increase the tilting of the scapula anteriorly and internally rotated. Labriola¹⁵ explained that pectoralis minor tightness will resist the scapular movement upward rotation and external rotation. Releasing the pectoralis minor muscle which is short will increase the subacromial space.

V. Conclusion

This article concluded that pectoralis minor tightness will directly or indirectly add to the cause of subacromial impingement. Because of the tight pectoralis minor, there is a limited or restricted range of motion of the scapula majorly upward rotation and external rotation.

Abbreviations

Abbreviations	Full form
SAIS	Subacromial Impingement syndrome
GH capsule	Gleno-Humeral capsule
MFR	Myo-Fascial release
MET	Muscle Energy Technique
SIS	Shoulder Impingement syndrome
ET	Exercise Therapy
PT	Physiotherapy
VAS	Visual Analog Scale
ROM	Range Of Motion

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