



# Determining Specificity and sensitivity of TFCC compression test for diagnosis of Triangular fibrocartilage complex injury:A Pilot Study

Dr Pranav Rahane( Intern PES's Modern College of Physiotherapy)

Dr Unika Purohit( Asso. Professor PES's Modern College of Physiotherapy)

**Background:** TFCC is a load bearing structure on the ulnar aspect of wrist. As a evidence based practitioner physical therapist need to consider diagnostic accuracy of the test. The purpose of the study was to evaluate sensitivity and specificity of the test to rule in or rule out the injury.

**Method:** A cross sectional study was performed from Jan 22 to June 22. A purposive sampling technique was applied to select 7 participants. The special test was performed on the participants and the results were compared with the gold standard (MRI). The participants were categorized in the respective groups and sensitivity and specificity were calculated.

**Results:** Prevalence of the injury among the general population was 27% and 49% involving both traumatic and degenerative injury respectively. The TFCC compression test is neither sensitive nor specific for ruling in or ruling out TFCC injury(SN:0.14,SP:0.00)(p value less than 0.005).

**Conclusion:** It is clearly indicated that the test have very poor diagnostic accuracy for ruling in and ruling out TFCC injury. More focus should be given to history taking and physical examination rather than considering special test as a diagnostic tool.

**Keywords:** TFCC Compression test, Sensitivity, Specificity, Gold standard,

## Introduction

The triangular fibrocartilage complex(TFCC) is a load bearing structure between lunate, triquetrum and ulnar head acting as a stabilizer for the ulnar aspect of the wrist <sup>1</sup>.

One study found the prevalence of TFCC injury increases with age .The authors have found a 49% prevalence in patients age 70 or older and prevalence of 27% in patients age 30 or younger .<sup>2</sup>

Palmer proposed a classification system for TFCC lesion, which was based on a review of literature and a retrospective study of patients with wrist pain. He classified lesion as traumatic (class 1) and degenerative (class 2).

Forced ulnar deviance (swinging bat, racket, etc.) causes increased load on TFCC. In gymnastics the TFCC can be injured through overuse injury (both support skills and hanging elements). With repetitive weight bearing (both compressive and tensile), this area can become inflamed and tendonitis/tendonosis can develop in anchoring wrist ligaments(often misdiagnosed as wrist sprain) <sup>3</sup>.

Several physical tests can suggest the diagnosis of TFCC injury. These include Piano key test, TFCC compression test, Sharpey's test.

The gold standard is the best single test(or combination of tests) that is considered the current preferred method of diagnosing a particular disease. All the methods of diagnosing particular disease, including any new test, need to be compared against this 'gold standard'. The gold standard is different for different diseases <sup>4</sup>.

Sensitivity is defined as the ability of test to identify patients with a particular disorder . In other words, it represents the proportion of a population with the target disorder that has a positive result with the diagnostic test <sup>5</sup>.

Specificity is the ability of a test to identify patients that do not have the disorder in question. In other words specificity is the proportion of the population without the target disorder who test negative for the disorder <sup>6</sup>.

	Condition present	Condition absent
Test positive	a(True positive)	b(False positive)
Test negative	c(False negative)	d(True negative)

- Sensitivity :  $a / (a + c)$

True positive / (True positive+ False negative)

- Specificity :  $d / (b + d)$

True negative/(True negative+ False positive)

### Need of study

As evidence-based practitioner, physical therapists need to consider the accuracy of diagnostic tests. On the basis of sensitivity and specificity therapist can rule out or rule in the specific condition respectively.

Higher the specificity, higher the chances of particular condition to be present .

Higher the sensitivity, lesser the chances of particular condition to be present .

There are no statistical values for this test. The purpose of the study is to evaluate the accuracy of the test for ruling in or ruling out the TFCC injury.

### Hypothesis

#### Null hypothesis

$H_0$  : TFCC compression test is not specific and sensitive for ruling in and ruling out the TFCC injury respectively.

#### Alternative hypothesis

$H_1$  : TFCC compression test is specific and sensitive for ruling in and ruling out the TFCC injury respectively.

$H_{12}$  : TFCC compression test is specific but not sensitive for ruling in the TFCC injury .

$H_{13}$  : TFCC compression test is sensitive but not specific for ruling out the TFCC injury .

### Review of literature

1. Triangular Fibrocartilage Complex Kyle Casadei et al.

The triangular fibrocartilage complex (TFCC) is a load-bearing structure between the lunate, triquetrum, and ulnar head. The function of the TFCC is to act as a stabilizer for the ulnar aspect of the wrist. The TFCC is at risk for either acute or chronic degenerative injury. Forced ulnar deviation and positive ulnar variation carry associations with injuries to the TFCC. Patients with TFCC injury will present with ulnar-sided wrist pain that may present with clicking or point tenderness between the pisiform and the ulnar head. MRI imaging is useful as a preliminary diagnostic tool; arthroscopy is the diagnostic gold standard. Treatment options

include conservative therapies such as rest, NSAIDs, and corticosteroid injections as well as operative management.

2. Prevalence of Triangular Fibrocartilage Complex Abnormalities Regardless of Symptoms Rise With Age: Systematic Review and Pooled Analysis Jimmy J. Chan BSc, Teun Teunis MD, David Ring MD, PhD Triangular fibrocartilage complex abnormalities are common in symptomatic [13, 22] and asymptomatic wrists [10, 12] and in affected and unaffected wrists in the same patient [4, 5]. Moreover, triangular fibrocartilage complex abnormalities seem increasingly common with age [10, 11, 16, 25]. Signal abnormalities on MRI and pathophysiology identified on wrist arthroscopy tend to be interpreted as “tears”, but as with lower back pain, lower back pain, wrist pain is common and often difficult to relate to a specific pathophysiology. A substantial percentage of displaced fractures of the distal radius are associated with traumatic injury to the triangular fibrocartilage complex, but these traumatic lesions rarely are repaired and seem to have little or no long-term consequences.
3. Understanding and using sensitivity, specificity and predictive values Rajul Parikh, Annie Mathai, Shefali Parikh, G Chandra Sekhar, Ravi Thomas et al. In this article, we have discussed the basic knowledge to calculate sensitivity, specificity, positive predictive value and negative predictive value. We have discussed the advantage and limitations of these measures and have provided how we should use these measures in our day-to-day clinical practice. We also have illustrated how to calculate sensitivity and specificity while combining two tests and how to use these results for our patients in day-to-day practice.

#### Materials used

- Pen
- Paper
- Consent form

#### Inclusive criteria

- Gender : both males and females
- Age : 20 – 70 years
- Individual with medial sided wrist pain
- Both acute and chronic cases

#### Exclusive criteria

- Recent distal radius or ulnar fracture
- Any previous wrist ligament injury
- Any deformity of wrist and hand
- Individuals diagnosed with advanced osteoarthritis of radiocarpal joint.

#### Methodology

- Study design: Cross sectional study
- Study setting: OPDs in and around Pune.
- Study duration: 6 months
- Sample size : 7
- Sample design : Purposive sampling

## Procedure

- Study began with the presentation of synopsis to an ethical committee and clearance was obtained.
  - Various OPDs were visited in and around Pune.
  - Subjects were selected on the basis of inclusion and exclusion criteria.
  - Subjects were explained about the nature of study before starting the procedure and consent was taken from the patients.
  - Initial data was collected and evaluation was done by performing TFCC compression test .
1. TFCC compression test : Fixate the patients distal radius and ulna with one hand. Grab patients hand at level of metacarpals from radial side and bring wrist into ulnar deviation along with axial compression. The test is positive with reproduction of symptoms .
- The outcomes of the test was compared with the gold standard measure.
  - The specificity and sensitivity values were calculated by formula.

## Result

Total 7 Participants were examined using TFCC compression test 1 patient was tested positive who was diagnosed with TFCC injury on MRI and 6 were tested negative who were diagnosed with TFCC injury on MRI.

Pearson's chi square test was used for the statistical analysis. P value was 0.044045 with chi square statistics 4.0548 .The result for sensitivity(0.14) and specificity(0.00) of TFCC compression test for ruling in or ruling out was significant at the p value < 0.05

## Discussion

The TFCC consists of two anatomical components: the disc and a peripheral portion. The disc is a simple structure that functions as a shock absorber of the UC joint, whereas the peripheral portion is a very complicated structure that comprises the distal radioulnar ligaments, UC ligaments, the meniscus homologue, and the tendon sheath of the ECU tendon, and functions as a stabilizer of DRUJ and UC joint.

Total 7 Participants were included in the study based on inclusion and exclusion criteria. This study showed that TFCC compression test is not useful for diagnosing injuries to TFCC, specificity(0.00) and sensitivity(0.14). These findings must be interpreted with an understanding of the limitations of the study.

In Acute cases, the injured area being infiltrated by inflammatory mediators, leaving it more sensitive lead us to the false positive test. We believe that failure to provoke could be because of one of following 1) application of inadequate pressure, 2) adaptation of nociceptors to axial loading stress, which resulted in majority of false negative tests.

In one report, the accuracy of MRI has been demonstrated to be as high as 95% in detecting TFCC tears. MRI combined with provocative tests improved the proportion of correct diagnoses of TFCC injuries by 13% and lunate cartilage damage by 8%. MR imaging is especially useful in planning surgical treatment by showing the exact location and extent of these lesions.

Cook et al stated that more focus should be given to the History taking and physical examination rather than only considering special tests as a diagnostic tool. He believed that special test or group of tests(with moderate to high clinical value)should only be used after the brief History and considering typical signs and symptoms in examination, either to include or exclude particular condition.

According to Prosser et al, irrespective of diagnostic accuracy of the special test, Particular attention should be given to the Physical examination on some points as many patients presented with the same sign and symptoms, few are 1.Tenderness at the dorsal site of the UC, click and pain on rotation of the forearm 2. Sport specific injury and MOI 3. Pain on resisted wrist extension and ulnar deviation 4. Inability to work or

tolerate the military training, and decreased grip strength (40% to 35% of the uninjured hand).Hence, in future the test should be used with caution for predicting TFCC injuries

Based on this study, it is clearly indicated that TFCC compression test has very poor diagnostic accuracy based on Specificity and sensitivity, it cannot be used for predicting TFCC injuries.

### Limitations

- The sample size was less.
- The age group considered for the study was large, involving children, younger ones and older individuals.

### Future study

- Further studies need to evaluate diagnostic accuracy of the same test with larger sample size and considering specific population.
- Diagnostic accuracy of physical examination can be evaluated .
- Accuracy of other tests for diagnosing TFCC injury can be done by determining Specificity and sensitivity.
- Combination of tests/Clusters can be created and evaluated by further studies for their diagnostic accuracy

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