

A Cadaveric Study on Posterior Interosseous Nerve for Radial Tunnel Syndrome

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Abstract: Radial tunnel syndrome is characterized by pain along the course of posterior interosseous nerve in the upper part of anterior aspect of forearm in the cubital fossa. But the diagnosis of radial tunnel syndrome is difficult because of its close association with lateral epicondylitis. In this study the course of posterior interosseous nerve is studied in 58 formalin fixed upper limb specimens by applying the Rule of Nine test and the results were noted. Out of 29 right upper limb specimens, the posterior interosseous nerve traversed through lateral column in 23 specimens and in middle column in 6 specimens. In the remaining 29 left upper limb specimens also the same results were noted. On conclusion the prevalence of orientation of posterior interosseous nerve is comparatively higher in lateral columns than the middle columns. Hence the knowledge of the course of posterior interosseous nerve helps the clinician to identify the exact site of tenderness in the radial tunnel syndrome.

Key words: Rule of Nine test, Radial tunnel syndrome, posterior interosseous nerve.

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I. Introduction

Posterior interosseous nerve is the deep terminal branch of radial nerve which winds round the lateral aspect of radius to enter the back of forearm passing between the fibres of supinator. When posterior interosseous nerve is compressed within the fibres of supinator, it leads to a clinical condition known as radial tunnel syndrome (1,2). The diagnosis of radial tunnel syndrome is difficult because of its close association with lateral epicondylitis. Considering this clinical problem the present study has been undertaken to study the course of posterior interosseous nerve in order to improve the diagnostic accuracy in radial tunnel syndrome framing a new clinical test, the Rule of Nine test.

II. Aims and objectives:

1. To study the course of posterior interosseous nerve and to notify any variations
2. To prove whether, the rule of nine test is a reliable method of diagnosing radial tunnel syndrome

III. Materials and methods:

In this cross sectional study, a total of 58 upper limb specimens from 29 formalin embalmed cadavers including 22 male and 07 female cadavers were dissected to expose the posterior interosseous nerve in the cubital fossa before it passes between the fibres of supinator (3). The upper limb which showed gross asymmetry, any injury to forearm that damaged the posterior interosseous nerve or any surgical procedure that disturbed the posterior interosseous nerve were excluded from the study.

The rule of nine test consist of drawing up a large squared box over the anterior aspect of proximal part of the forearm with a fully extended elbow and fully supinated forearm. The sides of the squares were determined by the width of the elbow crease. This large square was further divided into 3 columns and 3 rows forming 9 smaller squares was mapped on to transparent OHP sheet which was then placed over the dissected specimen and the relation of the posterior interosseous nerve to the smaller squares were noted (4). The frequency of the smaller squares crossed by the posterior interosseous nerve were recorded.

IV. Observation:

Out of 58 upper limb specimens dissected, 46 specimens (79.3%) showed the posterior interosseous nerve passing through the lateral column and 12 specimens showed the posterior interosseous nerve passing through the middle column (20.7%) and none (0%) of the specimen showed the posterior interosseous nerve passing through medial column.

Table: 1 Distribution of course of posterior interosseous nerve

| Course of posterior interosseous nerve | Number of specimens | Percentage (%) |
|--|---------------------|----------------|
| Lateral column | 46 | 79.3 |
| Middle column | 12 | 20.7 |
| Medial column | 0 | 0 |
| Total | 58 | 100 |

Out of the 29/58 right upper limb specimens the posterior interosseous nerve oriented in the following manner:

- Across the lateral 1 and 2 squares in 22 specimens.
- Lateral 1 square in 1 specimen
- Middle 1 square in 4 specimens
- Middle 2 and 3 squares in 1 specimen and
- Middle 1 and 2 squares in 1 specimen

Out of 29/58 left upper limb specimens the posterior interosseous nerve oriented in the following manner:

- Across the lateral 1 and 2 squares in 16 specimens
- Lateral 1 square in 2 specimens
- Lateral 2 and 3 squares in 1 specimen
- Lateral 2 square in 1 specimen
- In 3 specimens, it traversed in all 3 lateral squares
- In 3 specimens, it coursed across middle 1 square and
- In 3 specimens, it traversed across middle 1 and 2 squares.

V. Discussion:

The radial tunnel syndrome is a clinical condition which is caused by the entrapment of posterior interosseous nerve in the radial tunnel which is bounded by brachialis and biceps tendon medially and the extensor muscles of forearm anterolaterally. Other reported causes of posterior interosseous nerve palsy include neuromas (5), schwannomas (6), traumatic aneurysms of the posterior interosseous artery (7), neurofibromas (8), ganglion cysts (9) and myxomas (10). The most common site of posterior interosseous nerve compression is at arcade of Frohse, the entrance site of the nerve into the supinator muscle (11). Millerder L H et al reported the radial tunnel syndrome can also occur secondary to rheumatoid arthritis (12). Posterior interosseous nerve lesion can also occur during exposure of radial tuberosity for surgical repair of distal biceps tendon rupture (13).

Werner C conducted a study in 10 patients with non-traumatic posterior interosseous nerve paralysis which caused by tumors located posteriorly beneath the posterior interosseous nerve where that nerve entered the supinator muscle (14). Van Rossum J et al conducted a study in which he reported the resistant tennis elbow syndrome is not associated with any signs of entrapment of radial nerve (15).

Various studies have been conducted for the diagnosis of radial tunnel syndrome as per the available literature. In a study done by Loh Y C et al, out of the 19 upper limbs studied, it was observed that the posterior interosseous nerve travelled consistently across the lateral column of the constructed square grid in both right and left upper limbs of all specimens (100%) (4).

Of the 9 right upper limb specimens, in 2 specimens posterior interosseous nerve traversed across the lateral 1 and 2 squares, in 2 specimens it traversed the entire lateral column and in 5 specimens it involved lateral 2 and 3 squares.

Of the remaining 10 left upper limb specimens, in 2 specimens it involved the lateral 1 and 2 squares, in 3 specimens it involved the entire lateral column and in 5 specimens it traversed the lateral 2 and 3 squares (4).

Table:2 Comparison of course of posterior interosseous nerve on right and left side in the present study with previous studies.

| | Present study | | | Loh Y C et al | | |
|-------|----------------|---------------|---------------|----------------|---------------|---------------|
| | Lateral column | Middle column | Medial column | Lateral column | Middle column | Medial column |
| Right | 23 | 6 | 0 | 9 | 0 | 0 |
| Left | 23 | 6 | 0 | 10 | 0 | 0 |
| Total | 46 | 12 | 0 | 19 | 0 | 0 |

VI. Conclusion:

In lateral epicondylitis the pain will be felt on lateral epicondyle of humerus, whereas in radial tunnel syndrome the pain will be felt along the course of the posterior interosseous nerve. The knowledge of the course of posterior interosseous nerve helps the clinicians to identify the exact site of tenderness in the radial tunnel syndrome. On conclusion by this study, it is observed that the prevalence of orientation of posterior interosseous nerve is comparatively higher to the lateral columns than the medial columns. These findings are of relevant significant to the neurovascular surgeon, neurophysicians and orthopaedic surgeons to plan and modulate the mode of treatment for radial tunnel syndrome.

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Fig 1: Relation of posterior interosseous nerve to the constructed square- Bar chart

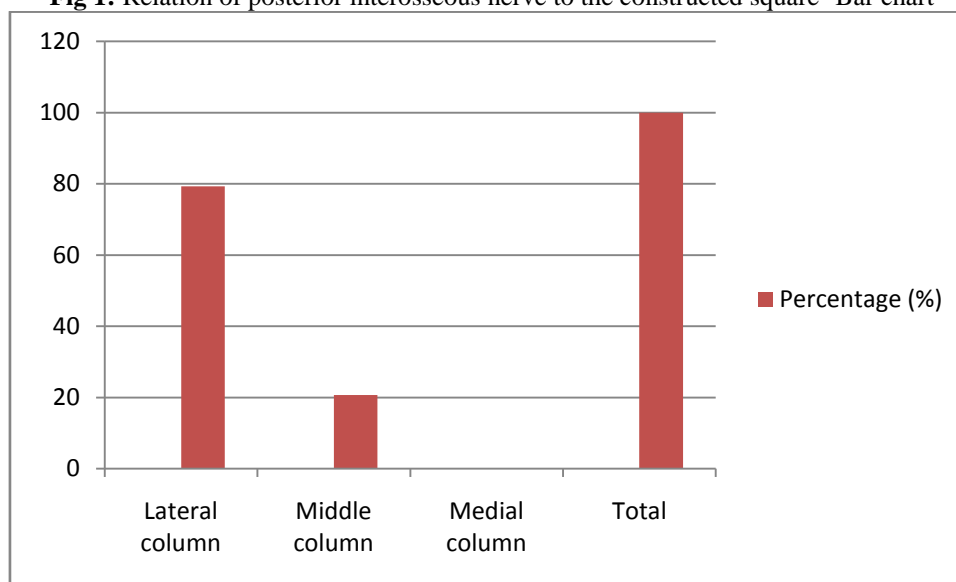


Fig: 2a&2b Most common relation of posterior interosseous nerve to the constructed square: 2a – RIGHT SIDE. 2b- LEFT SIDE.

| | | |
|-----------|--|--|
| Lateral 1 | | |
| Lateral 2 | | |
| | | |

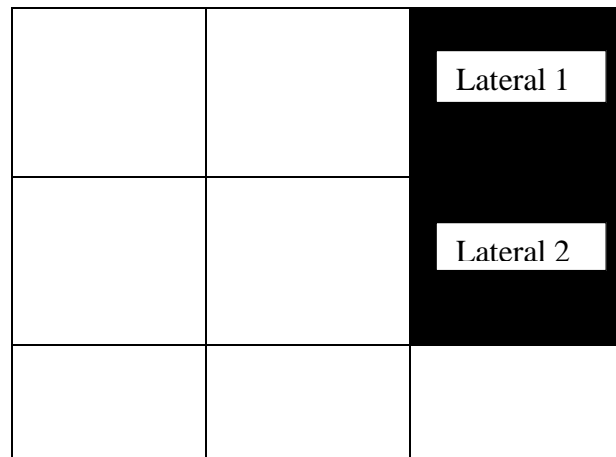


Fig 3: Representative picture to show the posterior interosseous nerve (arrow) in the upper 2 lateral squares – right side



Fig 4: Representative picture to show the posterior interosseous nerve (arrow) in the upper 2 lateral squares – left side



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