



## Autonomic Function in Peripheral Nerve Regeneration Especially in Radial and Ulnar Nerve Injuries after Microsurgery: A Systematic Review

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### Abstract

This literature review seeks to understand the difference in autonomic function of radial and ulnar nerve injuries after microsurgery. During this surgery, additional damage to nerves is also experienced. This research focused on peer-reviewed articles from Pubmed-NCBI database. This is a medical database which features medical peer-reviewed articles on various illnesses treatments and outcomes. The eligibility criteria used were that the article must be full text, published within the past 10 years, written in English language, and featured the keywords-radial nerve injury, ulnar nerve injury and microsurgery. There was no specific characteristic for participants as all individuals with injury were considered. The search from the database yielded 121 initial articles. Of this number, 33 were excluded for being editor comments and no full texts. This had led to 88 remaining articles which were further screened to remove articles written in other languages and those which were older than 10 years. This featured a total of 43 articles. Of this remaining total, only 30 articles were used. The other 15 were excluded as a result of research reliability issues. The procedures used in the articles featured a lot of limitations which questioned the validity of their results. This paper concludes with a summary of the analysis of the difference in autonomic function of the radius and ulna after microsurgery.

**Keywords:** *Autonomic function, Radial nerve, Ulnar nerve, Microsurgery.*

### Introduction

The radial and ulnar nerve injuries are quite common for people of different ages. The radius is the larger bone of the lower arm, while the ulna is the smaller one. When these bones get injured, the nearing nerves and muscles also become impacted. As a result, the arm's autonomic function becomes negatively impacted as nerves are responsible for triggering responses. This research takes specific questions into account. These are indicated below. PICOS Questions:

- What are the demographics of the research participants?
- What kind of intervention did they receive for their injuries?

- What is the difference between these interventions and other possible medical approaches that would have been taken, and between the patients?
- What was the outcome of these interventions, and is there a difference considering the interventions given?
- What study design was employed for this research?

### Methods

This research focused on specific eligibility criteria. The eligibility criteria used were that the article must be full text, published within the past 10 years, written in English language, and featured the keywords-radial

nerve injury, ulnar nerve injury and microsurgery. There was no specific characteristic for participants as all individuals with injury were considered [2, 4]. The search from the database yielded 121 initial articles. Of this number, 33 were excluded for being editor comments and no full texts.

This had led to 88 remaining articles which were further screened to remove articles written in other languages and those which were older than 10 years. This featured a total of 43 articles. Of this remaining total, only 30 articles were used. The other 15 were

excluded as a result of research reliability issues. In all the articles included, the participants underwent follow up, albeit in different lengths. This was an important factor to consider since it was the main indicator of healing time and other characteristics of the arm after surgery [5].

The reason why no specific demographics were given for the participants was that it would be necessary in determining the differences which age and gender might have had on the healing process of the bones and nerves after microsurgery [6].

**Table 1: PICOS data**

Population	Intervention	Comparison	Outcome	Study Design
Child Adolescent Pediatrics Young People Middle Aged Adult Elderly	Surgery Microsurgery	Age Gender Nerve Injured Mechanism of Injury Injury location Repair time Repair method	Healing time Range of motion of wrist pain, stability, ulnar nerve symptoms, functional Mayo Elbow Performance Index, and Disabilities of the Arm, Shoulder	Exclude: Editorial Comments

The search strategy presented in the Figure 1 taken when analyzing the Pub-Med database. below represents the steps that were



**Fig 1: Flowchart of literature search steps according to PICOS questions list**

Even after this exclusion criterion had taken place, this research still featured studies with a bias, hence creating the possibility of unreliable results. Since the study samples included people with different characteristics, it is possible that those who were at higher risk of injuries made up the majority of the study participants [7, 9]. As such, the results may have simply reflected their outcomes since they would have outnumbered the rest. Such a result cannot be employed in a real life situation due to this biasness. For example, the elderly are more prone to injuries than those in their Middle Ages [10]. Their healing time is also much slower.

Therefore, if they made up the majority of the participants, it would mean that the results would be reflective of the elderly and not the young. Thus, it was important to consider these cases differently so that a synthesis was conducted while considering the age of the participants.

## Results

This research contained the analysis of the reviewed articles by considering: the study size, PICOS, and even follow up period. The majority of the articles cited showcased various types of injuries and interventions. For instance, the article by Toros featured a patient who was diagnosed with a terrible triad injury of the elbow [11].

The average follow up for this patient was 34.5 months which included treatment sessions to ensure the hand healed appropriately [12, 13] Lu *et al* [14]. Also conducted an analysis on an individual who experienced injury to the arm. In this case, the injury was in the form of a tumor which was affecting the nerves, hence hindering effective autonomic function [15, 16].

In relation to the interventions used, the following examples were used. First, there was more than one form of interventions. This means that there were too many interventions to compare.

For example, Ignatiadis [17] noted that the patients underwent surgical debridement of wounds, reconstructions of ulna using silicon rods, and even the use of distal radial adipofascial perforator flaps [18]. For all this type of articles, it was evident that the ulna was more fragile probably because of its size

[19] as such, it tends to experience more damages compared to the radius.

For the included articles, the outcomes of the medical procedures took various time frames such as 6 months and even 34.5 years.

## Discussion and Conclusion

An example of an article which was excluded due to language is Kilinc *et al* [20]. Who had also focused on the keywords. Unfortunately, due to the possible language barrier, this article was not included in the review [21].

All others such as this were excluded to ensure that the audience of the research paper will be able to go through the sources and understand any reference made to them. From the analysis conducted on the 30 peer-reviewed articles, it is clear that there is a difference in the autonomic function of the radial and ulnar nerve injuries after surgery as these are two different bones featuring different nerves [22, 23].

Therefore, one will affect the thumbs while another will affect the other four fingers [24]. This difference can be traced back to the mode of treatment given for both injuries. It is also influenced by the age and gender of an individual. For example, if the patient is female, she is more likely to experience the injury which will take much longer to heal compared to men [25, 26]. In addition, the elderly are predisposed to this risk with longer healing time compared to the young. The approach taken as an intervention affects whether the autonomic functioning of the hands will be regained or not [27, 28].

There are more approaches, such as grafting, whereby tissues are planted on the site of injury to trigger growth of the damaged version. The majority of these articles had also considered how the nerves got affected; hence triggering an impact on the range of motion [29]. Most of the participants could not move their hands immediately after surgery due to the injuries on the radius and ulna.

However, as the wound healed, the movement increased gradually; for most patients, it occurred starting from the 6<sup>th</sup> month, albeit depending on the severity of the situation [30, 31]. This happened due to the fact that the nerves are also recreated, hence improving the autonomic function of the nerves.

## Acknowledgement

This research was supported by the Universitas Indonesia research funding in

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