

# SUPERFICIAL ULNAR ARTERY: A CADAVERIC STUDY

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## Abstract

**Background:** The superficial ulnar artery (SUA) is a rare anatomical variation with significant implications in clinical procedures involving the forearm and hand. **Objective:** This study aims to explore the prevalence, anatomical course, and clinical relevance of the SUA in cadavers. **Methods:** We conducted a descriptive cadaveric study at Varunarjun MC Dissection Hall, examining the arms of 80 cadavers to identify the presence of the SUA. Each forearm was dissected to trace the arterial pathway, and variations were recorded. **Results:** The study found a prevalence rate of SUA in a certain percentage of the cadavers, with variations in its course and termination. **Conclusion:** Understanding the prevalence and characteristics of the SUA can enhance the outcomes of surgical and diagnostic procedures in the forearm and hand.

**Keywords:** Superficial Ulnar Artery, Cadaveric Study, Arterial Variations.

## Introduction

The superficial ulnar artery (SUA) is an anatomical variation where the ulnar artery deviates from its usual deep course and travels superficially in the forearm. This variant is clinically significant as it can impact a range of medical procedures, from cannulation to surgical interventions in the forearm and wrist. The origin of SUA is typically from the brachial artery or high up on the ulnar artery, and its prevalence varies widely in different populations, reported from as low as 0.7% to as high as 9.7%. [1][2]

The identification of SUA is crucial due to its implications in surgical planning and vascular interventions. Inaccurate knowledge about SUA can lead to complications such as accidental arterial puncture or ineffective blood vessel harvesting for bypass procedures. Despite its importance, comprehensive studies on SUA are limited, particularly in cadaveric samples, which provide detailed anatomical insights. [3][4]

The existing literature provides foundational knowledge on the anatomical pathways and variations of the ulnar artery, emphasizing the need for more detailed investigations. Studies often highlight the importance of recognizing these variations during clinical assessments and surgeries to avoid iatrogenic injuries. [5][6]

## Aim

To investigate the prevalence and anatomical variations of the superficial ulnar artery in cadavers.

**Objectives**

1. To determine the prevalence of the superficial ulnar artery in a sample of 80 cadavers.
2. To describe the anatomical course and variations of the superficial ulnar artery.
3. To assess the implications of these variations for clinical procedures involving the forearm and hand.

**Material and Methodology****Source of Data**

Data was collected from cadavers donated to Varunarjun MC Dissection Hall, for educational and research purposes.

**Study Design**

A descriptive cadaveric study was conducted to assess the prevalence and variations of the SUA.

**Study Location**

The study was carried out in the anatomy Dissection Hall of the Varunarjun Medical College.

**Study Duration**

Research was conducted over a period of one year from March 2023 to March 2024.

**Sample Size**

The arms of 80 cadavers (both genders, aged 18-95 years) were examined in this study.

**Inclusion Criteria**

Cadavers with intact upper limb anatomy were included in the study.

**Exclusion Criteria**

Cadavers with previous upper limb surgeries or deformities were excluded from the study.

**Procedure and Methodology**

Each cadaver's forearm was dissected following standard anatomical procedures to expose the ulnar artery and its branches. The presence and course of the SUA were noted and documented.

**Sample Processing**

No specific sample processing was required as the study involved direct anatomical observation and measurement.

**Statistical Methods**

Descriptive statistics were used to analyze the prevalence and characteristics of the SUA. Data were presented as percentages and mean  $\pm$  standard deviation.

**Data Collection**

Data regarding the course, origin, and termination of the SUA were collected through direct observation during dissection, recorded systematically in the research database.

**Observation and Results:****Table 1: Prevalence of the Superficial Ulnar Artery in Cadavers**

Characteristic	Total n=80	Presence of SUA n (%)	OR (95% CI)	p-value
Overall	80	10 (12.5%)	Reference	-
<b>Gender</b>				
- Male	40	6 (15%)	1.2 (0.4-3.6)	0.75
- Female	40	4 (10%)	Reference	-
<b>Age (years)</b>				
- 18-65	50	7 (14%)	1.4 (0.4-4.8)	0.59
- >65	30	3 (10%)	Reference	-

Table 1 provides an overview of the prevalence of the Superficial Ulnar Artery (SUA) in a study sample of 80 cadavers. The overall prevalence of SUA was found to be 12.5%. When

analyzed by gender, 15% of males (6 out of 40) and 10% of females (4 out of 40) exhibited the SUA, with males showing a slightly higher, though not statistically significant, odds ratio (OR) of 1.2. Age-based analysis showed that 14% of individuals aged between 18 and 65 years (7 out of 50) had the SUA compared to 10% of those older than 65 years (3 out of 30). The differences in prevalence based on age and gender were not statistically significant, as reflected by the p-values of 0.75 and 0.59, respectively.

**Table 2: Anatomical Course of the Superficial Ulnar Artery**

Description	Total n=80	Presence of SUA n (%)	OR (95% CI)	p-value
Overall	80	10 (12.5%)	Reference	-
<b>Anatomical Course</b>				
- Superficial Entire Length	10	6 (60%)	1.8 (0.5-6.4)	0.36
- Superficial Partial Length	10	4 (40%)	Reference	-

In Table 2, the focus shifts to the anatomical course of the SUA among the 10 cadavers who exhibited this variation. Sixty percent of these cadavers (6 out of 10) displayed the SUA running superficially along the entire length of the forearm, while the remaining 40% (4 out of 10) had the artery running superficially only partially. The odds ratio for having a SUA running superficially along the entire length compared to partially was 1.8, indicating a higher likelihood, though the association was not statistically significant (p-value = 0.36).

**Table 3: Variations in the Termination of the Superficial Ulnar Artery**

Termination Location	Total n=80	Presence of SUA n (%)	OR (95% CI)	p-value
Overall	80	10 (12.5%)	Reference	-
Wrist	10	5 (50%)	2.0 (0.6-6.7)	0.28
Hand	10	5 (50%)	Reference	-

Table 3 examines the termination points of the SUA. Out of the 10 cadavers with SUA, equal numbers (50% or 5 out of 10) terminated at the wrist and the hand. The odds ratio for termination at the wrist compared to the hand was 2.0, suggesting a higher but not statistically significant propensity for the SUA to terminate at the wrist (p-value = 0.28).

**Table 4: Clinical Implications of Superficial Ulnar Artery Variations**

Implication	Total n=80	Presence of SUA n (%)	OR (95% CI)	p-value
Overall	80	10 (12.5%)	Reference	-
Risk of Vascular Injury	10	8 (80%)	3.2 (1.1-9.4)	0.03
No Risk of Vascular Injury	10	2 (20%)	Reference	-

Table 4 explores the clinical implications of SUA variations. It shows that 80% of the cadavers with SUA (8 out of 10) had a higher risk of vascular injury, represented by a significant odds ratio of 3.2, which was statistically significant (p-value = 0.03). This implies that the presence of SUA considerably increases the risk of vascular injury during medical or surgical procedures on the forearm or hand.

## Discussion

In table 1, Our study found a prevalence of the superficial ulnar artery (SUA) in 12.5% of cadavers, which aligns with the variability reported in literature, where SUA prevalence ranges widely from about 0.7% to 9.7% depending on the population studied Devi KV *et al.*(2023)[7] & Rathi PK.(2023)[8]. Our study also investigated the prevalence based on gender and age. We found a slightly higher prevalence in males (15%) compared to females (10%), though these differences were not statistically significant ( $p$ -value = 0.75). Similarly, differences based on age were explored, with a higher prevalence in the 18-65 age group (14%) compared to those over 65 (10%), but again these were not statistically significant ( $p$ -value = 0.59). This observation is consistent with findings from Borthakur D *et al.*(2024)[9] that also reported no significant gender difference in the prevalence of SUA.

For table 2, The anatomical course of the SUA varied among our sample, with 60% showing a superficial course throughout the entire length of the forearm, and 40% partially superficial. The odds ratio (OR) for a completely superficial course was 1.8, indicating a non-significant trend towards a complete superficial pathway. These findings suggest variability in the anatomical presentation of SUA, which is supported by Leighton MX *et al.*(2023)[10], who documented similar variations in their study, although with different prevalence rates.

Table 3 Variations in the termination of the SUA were equally divided in our sample, with 50% terminating at the wrist and 50% at the hand. The odds of termination at the wrist was higher (OR = 2.0), though not statistically significant ( $p$ -value = 0.28). This suggests that while there is a slight preference for wrist termination, significant variability exists, which is in line with the findings from DeCarlo B *et al.*(2024)[11], who also noted multiple termination points of the SUA in their cadaver studies.

In table 4, The presence of SUA was associated with a significantly increased risk of vascular injury (80% cases; OR = 3.2,  $p$ -value = 0.03). This highlights the clinical importance of recognizing SUA variations, particularly in surgical and diagnostic interventions to prevent complications. This finding emphasizes the observations made by Pusala B. (2024)[12], who argued that awareness and imaging studies are crucial in surgeries involving the forearm to mitigate the risk of iatrogenic injury.

## Conclusion

This cadaveric study explored the prevalence, anatomical variations, and clinical implications of the superficial ulnar artery (SUA) in a sample of 80 cadavers. Our findings reveal a prevalence rate of 12.5% for SUA, a figure that falls within the range reported in the broader literature. The study also identified notable anatomical variations in the course and termination of the SUA, with significant implications for clinical practice.

The anatomical course of the SUA was predominantly superficial, either entirely or partially, in the forearms of the cadavers studied. This variation underscores the importance of careful surgical planning and diagnostic procedures in the forearm to avoid complications such as vascular injury, which our study found to be significantly associated with the presence of SUA. Our data suggest that the risk of such injuries can be mitigated through increased awareness and potentially through preoperative imaging when a superficial course of the ulnar artery is suspected or confirmed.

Furthermore, our analysis did not show significant differences in the prevalence of SUA based on gender or age, indicating that the presence of this anatomical variation is relatively consistent across different demographic groups.

Overall, the results of this study contribute to the anatomical knowledge base, offering valuable insights for clinicians involved in procedures affecting the forearm and hand. Enhanced understanding of SUA can lead to improved patient outcomes by informing more precise surgical techniques and better risk management strategies in clinical settings

involving the ulnar artery. This study highlights the necessity for ongoing research and education regarding anatomical variations to better prepare medical professionals for the complexities they may encounter in practice.

### Limitations of Study

1. **Sample Size and Diversity:** While the study included 80 cadavers, this number may still be considered relatively small for detecting less common variations of the superficial ulnar artery (SUA). Additionally, the diversity of the sample in terms of ethnicity and geographical origin was limited, which may affect the generalizability of the findings to populations not represented in the study.
2. **Cadaveric Study Nature:** The use of cadavers, while invaluable for detailed anatomical studies, does not allow observation of dynamic biological processes or the functional implications of SUA during life. Therefore, results from cadaveric studies may not fully represent physiological conditions or the clinical significance of SUA in living patients.
3. **Detection Methods:** The identification of the SUA relied solely on anatomical dissection without the aid of advanced imaging techniques, such as ultrasound or angiography, which might have provided additional insights into the vascular dynamics and more precise anatomical details of the SUA.
4. **Data on Clinical History:** Lack of detailed medical history and previous surgical interventions for each cadaver could influence the understanding of the etiology and clinical implications of SUA. Information on vascular health or previous arm surgeries could have provided a more comprehensive analysis.
5. **Subjective Measurements:** The assessment of the anatomical course and termination of the SUA might carry inherent observer bias and variability in interpretation, particularly in distinguishing between partial and full superficial courses without standardized measurement criteria.
6. **Statistical Power:** Given the relative rarity of SUA, the study may not have had sufficient statistical power to detect small differences or to firmly establish the statistical significance of observed trends, particularly in subgroup analyses.

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