



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL  
OF ADVANCED RESEARCH

## RESEARCH ARTICLE

## A STUDY ON TORTUOUS COURSE OF PERIPHERAL ARTERIES OF UPPER EXTREMITY AND ITS EMBRYOLOGICAL, HISTOLOGICAL AND CLINICAL SIGNIFICANCE.

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**Manuscript Info****Manuscript History:**

Received: 15 August 2015  
Final Accepted: 22 September 2015  
Published Online: October 2015

**Key words:**

Brachial artery, Radial artery, ulnar artery, Tortuosity, Trans-radial coronography.

**\*Corresponding Author****Dr. Udaya Kumar P****Abstract**

**Introduction:** Tortuous course of arteries is usually observed in areas where there is a need for uninterrupted blood supply to mobile organs like spleen and uterus. The tortuous course of peripheral arteries is not uncommon. They may be asymptomatic.

**Materials and methods:** Out of 18 bodies [36 limbs on both sides], an elderly female cadaver of South Indian origin showed a bilateral tortuosity of brachial, radial and ulnar arteries during the routine undergraduate dissections in the Department of Anatomy, Mamata Medical College, Khammam, Telangana state. Histological specimens of the Brachial, Radial and Ulnar arteries were taken and stained with hematoxylin and eosin. The slides were observed for any changes in the vessel wall.

**Results:** tortuous course in brachial artery and its terminal branches were observed on both sides. The entire course of brachial artery is tortuous. The radial artery showed tortuosity in proximal third and distal third whereas the tortuosity of ulnar artery is confined to proximal third. Stained histological specimens of the Brachial, Radial and Ulnar arteries showed sclerotic changes tunica media.

**Conclusion:** Trans-radial approach in coronary angiography is gaining acceptance over trans-femoral coronary angiography. Its accessible site and early patient ambulation are factors for its increasing acceptance. Tortuous course of brachial and radial arteries affect the procedure time of Trans-radial coronary angiography and sometimes may lead to perforation. Detailed knowledge of variations in the normal anatomy of brachial and radial arteries is necessary for cardiologists during performance of the procedure.

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**INTRODUCTION**

The brachial artery is the continuation of axillary artery at the lower border of teres major muscle. It descends downwards in the arm deep to the deep fascia. The median nerve is in close proximity to the artery. In the cubital fossa, at the level of the radial tuberosity, the artery bifurcates into radial and ulnar arteries [1]. The course of the brachial artery and its terminal branches is straight.

We usually find tortuosity in splenic artery located close to the stomach and facial artery at the angle of mandible and also in uterine arteries. The reason for their tortuosity is to provide uninterrupted blood supply to the organ even during the movements and growth, as in uterine arteries during pregnancy. The tortuous course of peripheral arteries is not uncommon. But little is known on the mechanism of formation of the tortuous vessels in peripheral arteries. This article intends to discuss mechanisms postulated by various authors regarding tortuosity of these vessels.

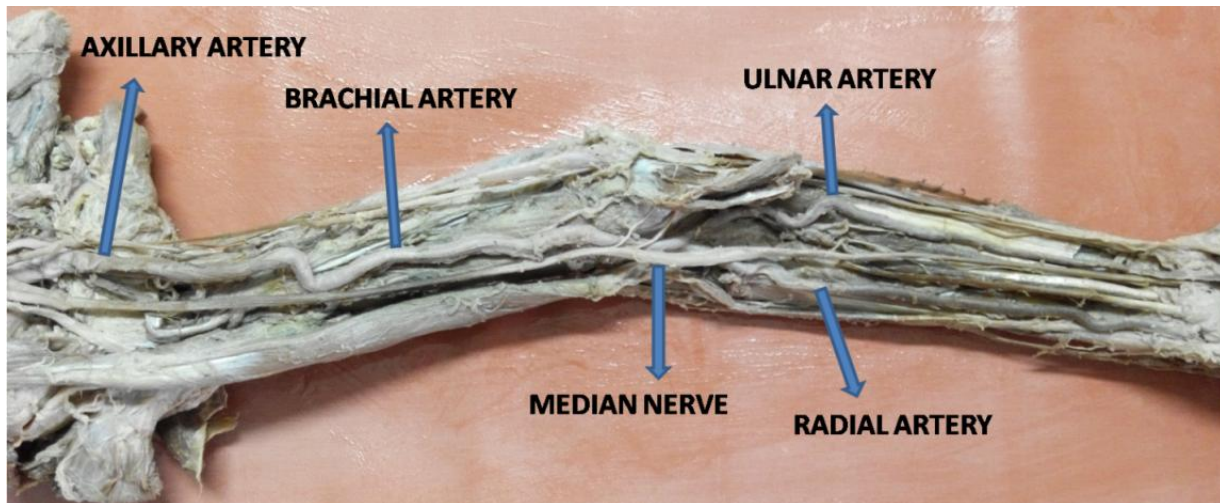
Trans-radial coronary angiography is gaining acceptance over trans-femoral route due to its accessible site and early patient ambulation [2, 3]. Radial artery, due to its frequent association with tortuosity may cause complications in trans-radial procedure [2]. The knowledge of variations in the brachial and radial arteries is necessary to the cardiologists during the performance of the above procedure.

### Materials and Methods:

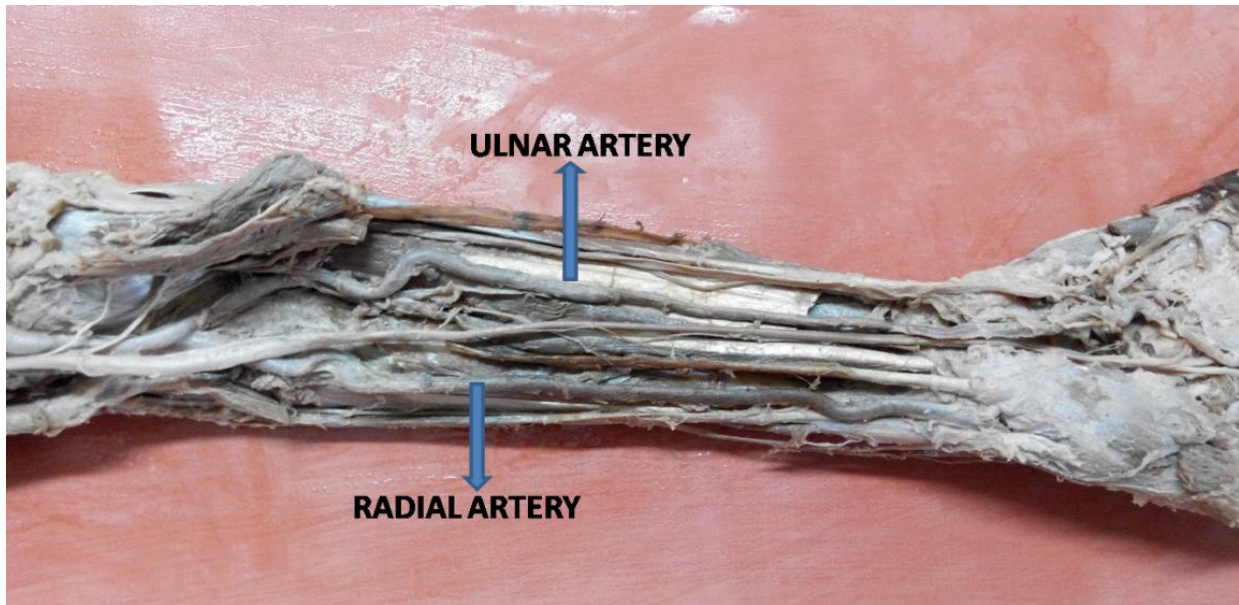
During routine undergraduate dissections, 36 upper extremities of eighteen formalin fixed cadavers (12 male and 6 female) of south Indian origin were observed, to find any variations in the course of the arteries, in the Department of Anatomy, Mamata Medical College, Khammam, Telangana state. Histological specimen of the tortuous artery was stained with hematoxylin and eosin. The slides were observed under compound microscope to find any variation in the vessel wall.

### Results:

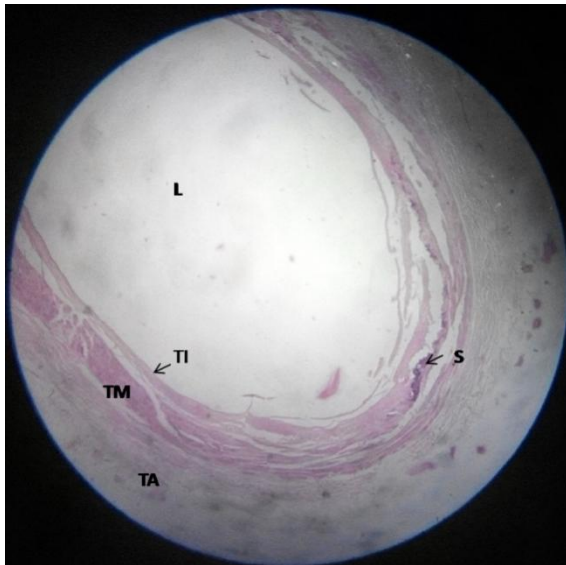
Out of 18 bodies, an elderly female cadaver showed a bilateral tortuous course in brachial artery and its terminal branches [fig.1]. The entire course of brachial artery was tortuous. The radial artery showed tortuosity in proximal third and distal third whereas the tortuosity of ulnar artery was observed to be confined to proximal one third [fig.2]. The course of Axillary artery on both sides was normal. The course of other arteries was also normal. In the Hematoxylin and Eosin stained histological preparations of these vessels, Tunica media showed sclerotic changes [fig.3] [fig 4].



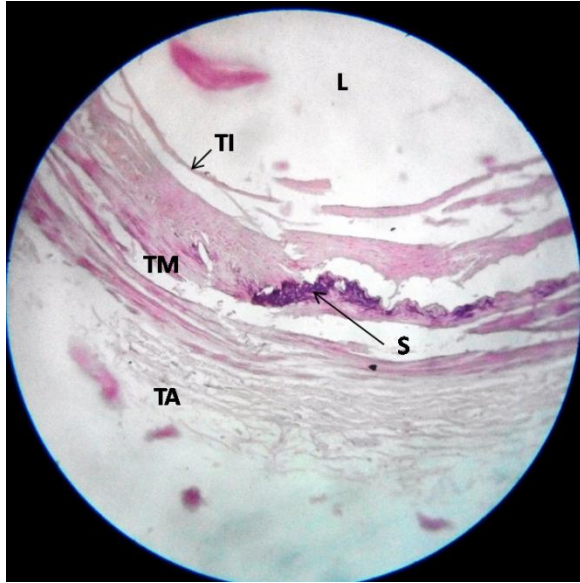
**Fig: 1** showing the tortuous course of brachial, radial and ulnar arteries in right Upper limb.



**Fig: 2** showing tortuosity in the proximal 1/3 of ulnar artery and tortuosity in the proximal 1/3 as well as distal 1/3 of radial artery [Right Upper limb].



**Fig: 3** showing transverse section of radial artery under magnification 5X, stain: Hematoxylin & eosin. L – Lumen, S – Sclerotic tissue, TI – Tunica Intima, TM – Tunica Media, TA – Tunica Adventitia. Sclerotic changes in the tunica media can be seen.



**Fig: 4** showing transverse section of radial artery under magnification 10X, stain: Hematoxylin & eosin. L – Lumen, S – Sclerotic tissue, TI – Tunica Intima, TM – Tunica Media, TA – Tunica Adventitia.

## DISCUSSION:

Tortuous course of brachial and radial arteries have been reported earlier. Tortuous brachial artery is less common compared to that of radial artery. The tortuous brachial artery does not cause problems clinically due to its larger diameter, whereas radial artery, due to its smaller diameter, is considered to cause significant difficulties during trans-radial approach of coronary angiography [4]. Procedural failure is as high as 23.3% in severe radial tortuosity [4]. Li L, et al and Yazdankhah, et al observed that the Procedure failure rate is more common in females than males [3, 5]. Tortuous course may lead to perforation during performance of the procedure. Different types of tortuous vessels were described earlier. Tortuous vessels are of 4 types - curves, angulations, loops and spiral twists [6]. Radial loop is more common cause of procedural failure [4, 7]. Yoo BS, et al observed that, Tortuosity is common in proximal 1/3<sup>rd</sup> of radial artery (in 52.2%, out of 67 of cases) than distal 1/3<sup>rd</sup> [8], as compared to prakash et al [9], tortuosity is common in distal 1/3<sup>rd</sup> (in 30%, out of 15 cases). In the present study the tortuosity was observed in the entire course of brachial artery, in the proximal 1/3<sup>rd</sup> of ulnar artery and in proximal as well as distal thirds of the radial artery in both limbs. The tortuous vessels presented curves. Similar case of tortuous brachial, ulnar and radial arteries has been reported by ashwini c [10]. Tunica media showed smooth muscle bundles arranged longitudinally [10]. In the present study, sclerotic changes can be observed in the tunica media. Longitudinal arrangement of smooth muscle bundles was not observed. Vascular endothelial growth factor (VEGF) plays an important role in angiogenesis and vasculogenesis [11,12]. Sprouting angiogenesis is assumed to be facilitated by hypoxia, which up regulates the expression of a number of genes involved in vessel formation, their pattern and maturation, including nitric oxide synthase, VEGF, angiopoietin-2 [12]. The cause of tortuosity in the vessel wall is may be due to age, hypertension, genetic factors or unknown [2,5,6]. Vessel tortuosity may depend on mechanical factors like blood pressure, blood flow, axial tension and wall structural changes [6]. Buckling of the arteries may be one of the causes of tortuosity [6]. The chronic pressure on the vessel wall was considered as one of the important predisposing factors of tortuosity, resulting in the vessel wall thickness and also increase in the length of the artery(6).

## CONCLUSION:

Tortuous peripheral arteries are common and may be asymptomatic. Sclerotic changes were observed in Hemtoxylin and Eosin stained preparations. Trans-radial approach of coronary angiography is gaining acceptance now a days. Tortuous course of brachial and radial arteries affect the procedure time of Trans-radial coronary angiography and sometimes may lead to perforation. Detailed knowledge of variations in the normal anatomy of brachial and radial arteries is necessary for cardiologists during performance of the above procedure.

## ACKNOWLEDGEMENTS:



Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

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