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A Cadaveric study on Brachial Artery Tortuosity and Its clinical implications.

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ABSTRACT

A tortuous brachial artery is a vascular anomaly characterized by abnormal twisting or curving of the brachial artery along its course in the upper limb. Tortuous brachial artery pose clinical significance in diagnostic imaging, surgical interventions, and interventional procedures involving the upper limb. Such tortuosity may be congenital, developmental, or acquired due to factors such as aging, hypertension, or atherosclerosis. While often asymptomatic, it can present challenges in catheterization, blood pressure measurement, vascular access, and orthopedic or reconstructive surgeries. Awareness of this anomaly is important to prevent misinterpretation during radiological evaluation and to minimize iatrogenic injury during invasive procedures. This report highlights the anatomical characteristics, clinical implications, and relevance of a tortuous brachial artery, emphasizing the need for careful preoperative and diagnostic assessment.

Keywords: tortuous, brachial artery

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INTRODUCTION

The Brachial Artery, a critical component of the upper limb vascular system, is known for its anatomical variations and clinical significance. As a continuation of the axillary artery beyond the lower border of the teres major muscle, it typically follows a predictable course before bifurcating into radial and ulnar arteries at the level of the radial tuberosity.

Tortuosity of the brachial artery is an important anatomical variation that can significantly impact clinical procedures. Tortuosity is generally defined as the presence of bends or angulations exceeding 45–90 degrees [1], often resulting from mechanical factors like blood pressure, axial tension, wall structural changes, or even genetic predispositions [8, 9]. In some cases, tortuosity may be asymptomatic; however, it poses challenges during interventions such as trans-radial coronary angiography, where procedural failure rates can increase due to difficulties in catheter navigation through twisted vessels [4].

Aims and Objectives

The present work was done to study the course and tortuosity of brachial artery and its clinical importance.

MATERIALS AND METHODS

The present study was conducted by dissection of upper limbs of 18 adult human cadavers, all aged between 40 to 80 years, out of which 14 were male and 4 were female cadavers for a period of one year, Grant Government Medical College, Mumbai. Both the upper limbs were dissected course of the brachial artery was observed.

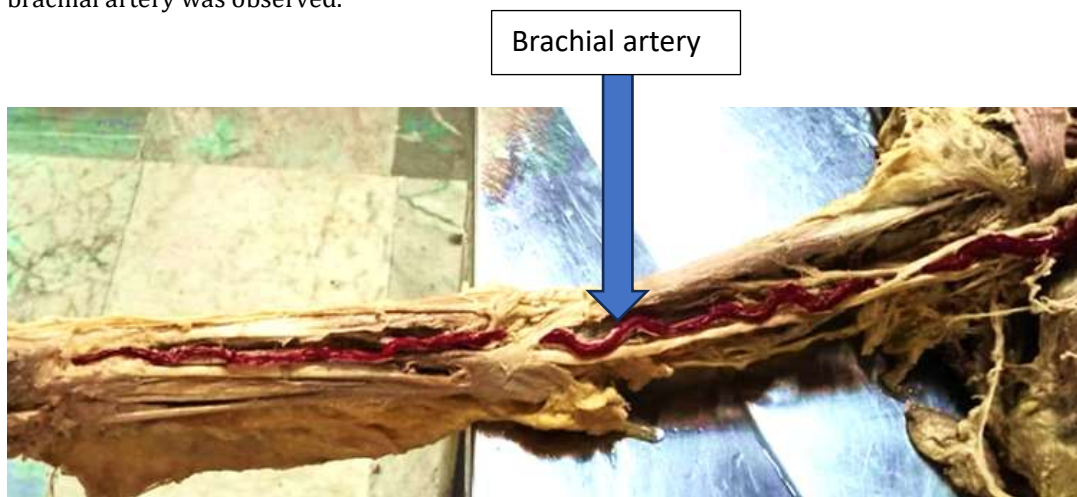


Figure 1

RESULTS

Out of 36 upper limbs, 3 limbs had tortuous brachial artery

DISCUSSION

The present study and the reviewed literature highlight the anatomical variations in the brachial artery, particularly focusing on tortuosity and its clinical significance. Tortuosity of the brachial artery and its terminal branches—radial and ulnar arteries—is a rare but clinically relevant variation that has implications across various medical specialties, including cardiology, vascular surgery, radiology, and orthopaedics.

The arteries of the arm can be recognized for the first time in an embryo of 4-7 mm [5]. The early limb bud receives blood via intersegmental arteries, which contribute to a primitive capillary plexus (2)

In the upper limb, the axis artery is derived from the lateral branch of the seventh cervical intersegmental artery that is subclavian artery. The proximal part of the main trunk of axis artery forms axillary and brachial arteries and its distal part continue as anterior interosseous artery and deep palmar arch [3].

Tortuous course of Brachial and Radial arteries have been reported earlier. Different types of tortuous vessels were described earlier. Tortuous vessels are of 4 types - curves, angulations, loops and spiral twists [4].

In the present study the tortuosity was observed in the brachial artery. The tortuous vessels presented curves. Similar case of tortuous brachial, ulnar and radial arteries has been reported by Ashwini c [5].

In one case report, a complete bilateral tortuous arterial tree from the axillary artery through to the superficial palmar arch was documented, which is considered an extremely rare occurrence [6].

In a study Out of 18 bodies, an elderly female cadaver showed a bilateral tortuous course in brachial artery and its terminal branches .The entire course of brachial artery was tortuous [7].

In other study involving 40 upper limbs, 2 specimens demonstrated tortuosity along the entire course of the brachial artery with involvement of its terminal branches [8].

The cause of tortuosity in the vessel wall is may be due to age, hypertension, genetic factors or unknown [9-11]. Vessel tortuosity may depend on mechanical factors like blood pressure, blood flow, axial tension and wall structural changes [11]. Buckling of the arteries may be one of the causes of tortuosity. 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 [11]. Abnormal collagen and elastin synthesis, often linked to connective tissue disorders like Arterial Tortuosity Syndrome (ATS) caused by mutations in the SLC2A10 gene, may lead to generalized arterial elongation and tortuosity [12].

Loeys-Dietz syndrome (LDS) is an autosomal dominant connective disorder that has been associated with extensive systemic involvement including craniofacial, skeletal, cutaneous and vascular (arterial tortuosity, aneurysm formation and dissection) abnormalities [13].

Clinical Implications

The presence of a tortuous brachial artery poses significant challenges in clinical settings:

Cardiology & Interventional Radiology

Trans-radial coronary interventions are increasingly preferred over femoral access due to lower complication rates and faster patient recovery [14]. However, tortuosity of the radial or brachial arteries increases procedural difficulty [15].

Pre-procedural imaging using Doppler ultrasound or angiography is recommended to identify tortuosity and plan accordingly.

Neurology

Tortuous arteries may exert pressure on adjacent nerves, potentially leading to focal neuropathies. [6].

CONCLUSION

The anatomical variations of the brachial artery, tortuosity is significant findings with broad clinical implications across various medical disciplines.

Importantly, the presence of tortuosity involving entire upper limb arterial tree, though rare, underscores the necessity for thorough preoperative vascular imaging using modalities such as Doppler

ultrasound or angiography. This ensures accurate diagnosis and planning, thereby minimizing risks associated with catheterization, surgical dissection, and trauma management.

Awareness and recognition of these anatomical deviations are crucial for optimizing patient outcomes, avoiding iatrogenic injury, and ensuring successful execution of both diagnostic and therapeutic procedures in upper limb.

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