International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 05, Issue 03, March 2020,
https://doi.org/10.23958/ijirms/vol05-i03/865

Original article

The Incidence and Characteristics of Marinacci Anastomosis: An Anatomical Study

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Received 12 February 2020; Accepted 06 March 2020; Published 11 March 2020

Abstract

Marinacci anastomosis, also known as Ulnar-Median anastomosis, is an anastomosis in which the branch anastomotic originates proximally in the ulnar nerve and unites distally with the median nerve. A purpose of this study was to determine the incidence and the characteristics of Marinacci anastomosis in the Bosnian population. The 60 anterior forearms of fresh frozen adult cadavers were dissected in the Department of Pathology, University Clinical Centre Tuzla and the morgue of Tuzla during a time period of two years. The Marinacci anastomosis was evidenced in one male forearm in the right side behind the ulnar artery, following an transversal course of 5.2 cm until its connection with the median nerve in only one branch. The incidence of Marinacci anastomosis was 1.67%. Since this anastomosis can expalin some cases where injuries in the forearm nerves are not reflected in the hand muscles, it is important to study. Our study contributes to a limited research on the Marinacci anastomosis, a condition that is rarely found and reported in anatomical research.

Keywords: ***Marinacci anastomosis, median nerve, ulnar nerve***

Introduction

Anastomoses between median nerve (MN) and ulnar nerve (UN) can occur in the forearm region. They may produce changes in innervation of the upper limb muscles, especially in a motor part of intrinsic hand's muscles. Anastomoses in the forearm can be classified as two types: Martin-Gruber anastomosis (MGA) and Marinacci anastomosis (MA). The MA, also known as reversed MGA or Ulnar-Median anastomosis, is an anastomosis in which the branch anastomotic originates proximally in the UN and unites distally with the MN [1,2]. The first case of MA has been reported by Marinacci in 1964. Marinacci reported a study of a patient with traumatized MN in the forearm. Despite this traumatization, the patient had the MN innervations in the hand muscles, as well as denervation of the flexor muscles in the forearm [3]. After this first study by Marinacci, the MA has been infrequently notified. In many studies this type of anastomosis had not been found, and therefore it is often considered as anatomical anomaly in the literature.

A purpose of this study was to determine the incidence and also the characteristics of MA anastomosis in the Bosnian population. The anastomosis between NM and NU in forearm is important to study, since it has implications for correct diagnosis of neuropathies, differentiation of a peripheral branch's injuries and prevention of complications during surgical procedures. We have compared our results to those of similar previous studies.

Materials and methods

The 60 anterior forearms of fresh frozen adult cadavers were dissected in the Department of Pathology, University Clinical Centre Tuzla and the morgue of Tuzla during a time period of two years. The dissected forearms were placed in the position of supine. We conducted an ‘S’ shaped incision from the lower limit od cubital fossa to the radiocarpal joint. This type of incision covered the whole anterior surface of the forearms. In order to give full exposure of the ulnar artery and UN, the superficial fascia was opened while the flexor carpi ulnaris muscle and tendon were mobilised. The branches of the UN in the forearms were dissected and anastomoses that occured between UN and MN were documented. An accurate anastomosis location has been determined by measuring an anastomosis distance from the medial epicondyle of the humerus. The medial epicondyle was a reference point zero, whereas a proximal anastomosis distance was a point 1 and a distal anastomosis distance was a point 2.The NU, NM and their respective branches were carefully dissected by usingsurgical glasses„ EF Telescope Single Vision“ with magnification of 3,5 and working distance of 18 inches. The lenght and diameter of identified anastomosis were measured with a caliper. All anatomical parts were photographed in order to register the anatomical arrangement and the relation with adjacent structures. By following the ethical principles for identity protection, we have stored the photographed material in the anastomosis archive at the Department of Neurology, University Clinical Centre Tuzla.

Statistical comparisons were performed using the chi-squared test. $P < 0.05$ was regarded as statistically significant.

Results

During the anatomical dissection of the 60 forearms of adult cadavers of both sexes (46 men and 13 women) of different age groups, we have found the MA in only one case (figure 1). Thus, the incidence of MA in this study was 1.67%. In particular, the MA was evidenced in one male forearm in the right side behind the ulnar artery, following an transversal course of 5.2 cm until its connection with the NM in only one branch. The diameter of MA was 1.2 mm. In this case, the lenght of forearm in male cadaver was 26 centimeters. The MA origin was on 6 cm distal to the lateral epicondyle, and is connection to the MN was on 6.9 cm distal to the lateral epicondyle (see table 1).

Table 1: Characteristics of the Marinacci anastomosis in one case found

Characteristic of MA	MA
Side	Right forearm
The lenght of forearm with MA (cm)	26
The lenght of the MA (cm)	5.2
The diameter of the MA (mm)	1.2
Path of the MA	Transversal
Distance of origin of the MA to LEH	6
Distance of connectionto the UN to LEH	6.9
Relation to UA	Behind
Relation to FDPM	In front of

MA=Marinacci anastomosis; LEH=lateral epicondyle of humerus; UA=ulnar artery; FDPM=deep flexor muscle of the fingers.

Discussion

In this study, we aimed at determining the incidence and the characteristics of MA in 60 anterior forearms of fresh frozen adult cadavers. The MN and UN are being developed from a similar embryonic region [4], which may cause the occurrence of MA. This finding supports what has been found in studies with high incidence of connections of peripheral nerves in monkeys, which in turn indicates a phylogenetic basis [1,5].

Previous studies have shown that the incidence of MA in electromyoneurographic studies may vary from 1.3% [6], 5% [7], to 16.7% [8]. Golovchinsky suggested that, when an ulnar to median anastomosis is suspected, special care should be exerted in evaluation of motor distal latency of the MN with a gradual and slow increase of the stimulus voltage [8]. In 2012, Felippe et al. dissected 30 forearms in the Anatomic Institute of Severino, Sombra University, and found a single piece that contains the MA. The incidence of MA according to Fellipe in anatomical study was 3.33% [9]. The MA branch originates proximally in the UN and inserts distally in the anterior interosseous nerve which is branch of MN. Moreover it was on the right forearm and the anastomotic branch was unique, measuring 7.4 cm long. The incidence of MA in our study was 1.67%. We compared our results with results from Fellipe's study and in both studies the MA was found in the male forearm on the right side. The lenght of MA in our study was 5.2 cm compared to 7.4 cm in the study of Felipe et al.

Previous research reports that the anastomosis between the UN and MN is important to study. There are several reasons for this. First, the MA may explain some cases where injuries in the forearm nerves are not reflected in the hand muscles [10]. Second, the connection between UN and MN can cause an alteration in the clinical symptomatology. As a result, the patient with an anastomosis between the UN and MN that has Carpal Tunnel Syndrome may present changes in the pattern of muscles innervation and in the sensitive part of the hand. These changes may, in turn, generate exacerbated or attenuated clinical symptoms that are different of the usual clinic. Besides, it is significant to prevent lesions of the anastomotic branches in surgical procedures of the upper limb [11].

Conclusion

The MA is a condition that is rarely found and reported in anatomical research. Our study contributes to a limited research on the MA by extending our knowledge on the existence of the anastomosis between UN and MN in forearm, its types of presentation and topography. Implications of our research vary from the correct diagnosis of neuropathies, differentiation between a complete and partial injury of a peripheral branch to prevention of complications in surgical procedures.

Figure 1: Dissection of the forearm showing the anastomosis of Marinacci. UN: ulnar nerve. MA: Marinacci Anastomosis. MN: median nerve.

Compliance with ethical standard

Conflict of interest

The author declares that they have no conflict of interest.

Ethical approval

The study was carried out according to 1964 Helsinki Declaration and was approved by the Institutional Ethics Committee.

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