

**Original communication****STUDY OF PERONEUS DIGITI MINIMI QUINTI IN INDIAN POPULATION: A CADAVERIC STUDY****Surekha D. Jadhav<sup>\*</sup>, Shilpa N. Gosavi, Balbhim R. Zambare***Department of Anatomy, Padamashree Dr. Vithalrao Vikhe Patil Foundation's Medical College, Ahmednagar, Maharashtra, India***RESUMEN**

Antecedentes: Peroneo meñique quinti es uno de los muchos músculos peroneos accesorios que por lo general se origina como un pequeño deslizamiento del tendón del peroneo lateral corto, alrededor del maléolo lateral, y se une a la aponeurosis dorsal del quinto dígito. No se conoce con precisión la prevalencia de la misma. Hay mucha confusión en la literatura, ya que existen múltiples clasificaciones superpuestas y una gran variedad de terminología descriptiva acerca de los músculos peroneos accesorios. Peroneo meñique quinti fue observado por algunos investigadores en la literatura, pero Macalister (1872) y Testut (1921) describen este músculo con sus variaciones en detalle. Material y métodos: Se estudiaron 100 miembros inferiores de cadáveres adultos de sexo desconocido. El compartimento lateral de cada pie se disecó cuidadosamente para determinar la incidencia del peroneo lateral del meñique quinti. Se observó su origen y la inserción, y se tomó el diámetro. Resultados: Se observó este músculo en el 51% de los casos, con predominio del lado izquierdo. Estaba presente bilateralmente sólo en un 5% las extremidades inferiores. Su diámetro varía de 0,7mm a 3mm. Informamos mayor incidencia de este músculo con la variación en sus anexos distales. El conocimiento de esta variante muscular es importante no solo para anatomistas sino también para los cirujanos en el diagnóstico de dolores de la región lateral del tobillo y del pie. Este músculo también se puede utilizar en el injerto y la reconstrucción en cirugía del pie y tobillo. Nuevos estudios deben ser realizados para determinar su incidencia en diferentes poblaciones con la ayuda del estudio en cadáver y nuevas técnicas.

**Palabras clave:** *peroneo meñique quinti, músculos peroneos, variación, cadáver.*

**ABSTRACT**

Background: Peroneus Digiti Minimi Quinti is one of many accessory peroneal muscles which usually originates as a small slip from the tendon of peroneus brevis, around the lateral malleolus, and attached to the dorsal aponeurosis of the fifth digit. The prevalence of it is not precisely known. There is much confusion in the literature, as there are multiple overlapping classifications and a vast array of descriptive terminology regarding the accessory peroneal muscles. Peroneus Digiti Minimi Quinti was observed by some researchers in literature but Macalister (1872) and Testut (1921) described this muscle with its variations in detail. Material and methods: We studied 100 lower limbs of adult cadavers of unknown sex. Lateral compartment of each leg was carefully dissected to determine the incidence of peroneus digiti minimi quinti. Its origin, insertion was noted and diameter was taken. Results: We observed this muscle in 51% of case with left side dominance. Bilaterally it was present only in 5% lower limb. Its diameter varied from 0.7 mm to 3 mm. We reported higher incidence of this muscle with variation in its distal attachments. Knowledge of this variant muscle is important not for anatomist but also for surgeons to diagnose lateral ankle and foot complaints. This muscle can also be used in grafting and reconstruction in foot and ankle surgery. Further studies should be performed to determine its incidence in different population with the help of cadaveric study and new techniques.

**Keywords:** *Peroneus digiti minimi quinti, peroneal muscles, variation, cadaver.*

*\* Correspondence to: Dr Surekha D Jadhav, Associate Professor, Dept. Anatomy, PDVVPF's Medical Collage, Vadgaon -Gupta (Viladghat), Post: M.I.D.C., Ahmednagar, Maharashtra, India. drsurekhadjadhav@gmail.com*

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## INTRODUCTION

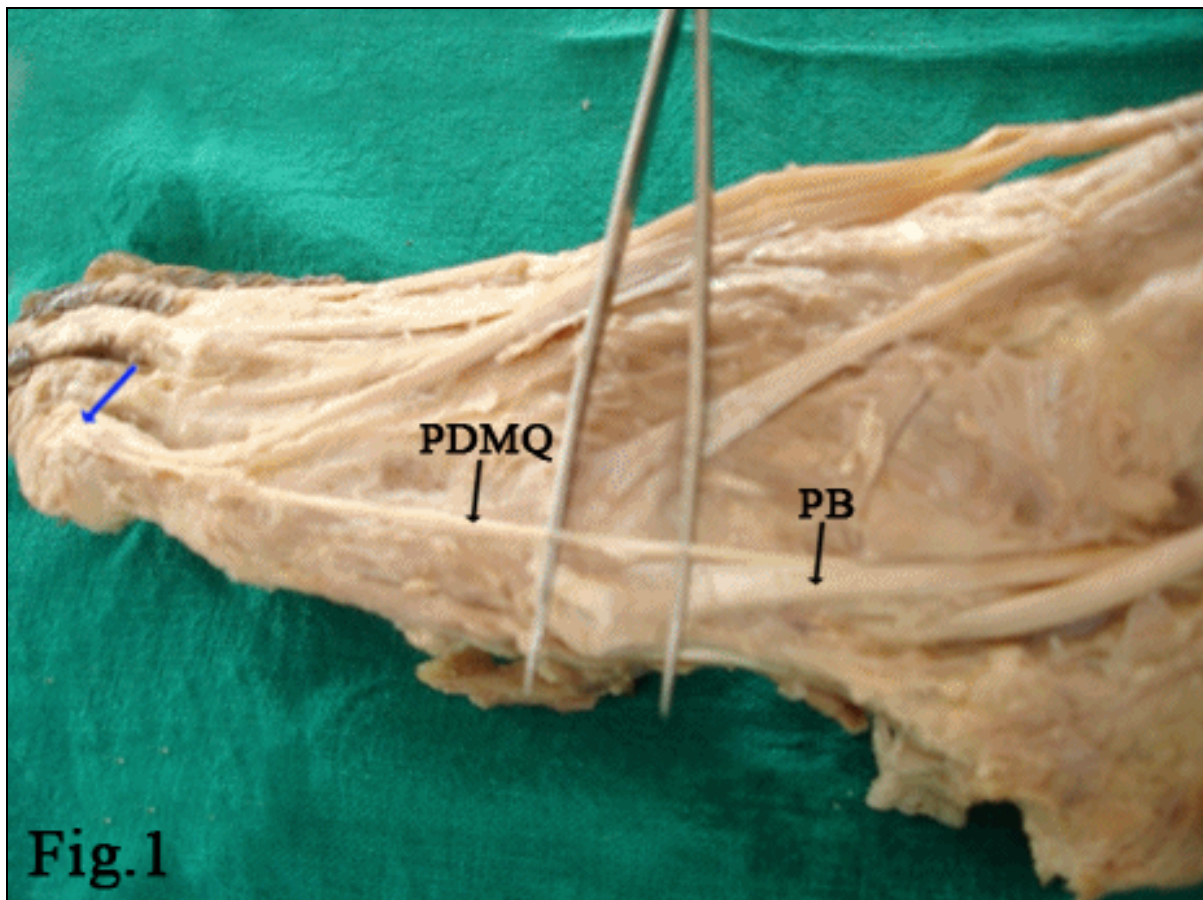
A large number of accessory peroneal muscles have been described in literature. These are peroneus quartus, peroneus accessorius, peroneocalcaneus externum, and peroneus digiti minimi quinti (Best et al, 2005, Sookur et al, 2008). The nomenclature applied to the variations of peroneal muscles is confusing and at times controversial because there are multiple overlapping classifications and variations in descriptive terminology. To resolve this confusion Sobel et al (1990), proposed that all such anomalous peroneal muscles are referred as "Peroneus quartus".

Peroneus digiti minimi quinti (PDMQ) is one of many accessory peroneal muscles. Macalister (1872) described variations of peroneal muscles. He described PDMQ as a small muscle which arises as a small slip from the tendon of peroneus brevis to the extensor aponeurosis of the little toe. Cunningham et al (1887) noted that,

PDMQ gets its innervation through the superficial fibular nerve. Presence of PDMQ is usually asymptomatic, but can be associated with pain or compressive neuropathy (Sönmez et al, 2000; Donley and Leyes, 2001).

Reported incidence of PDMQ in literature is 15-36% but it may be as high as 79.5% in cadaver studies (Reimann, 1981; Bareither et al, 1984; Cunningham et al, 1887; Bergman et al, 2011).

Accessory muscles are typically asymptomatic and encountered as incidental findings. Occasionally they are potential source of clinical symptoms which are due to mass effect of the supernumerary muscle, with the patient presenting with either a palpable swelling or secondary compression of adjacent structures such as nerves, vessels, or tendons (Sookur et al, 2008). Precise knowledge of PDMQ is important for clinicians, orthopedic surgeons and radiologist because they are involved in diagnosis, reconstructive surgery or imaging interpretation.



**Fig.1**

**Figure 1-** Blue arrow showing insertion of PDMQ on the dorsal digital expansion of 5<sup>th</sup> toe. PDMQ- peroneus digiti minimi quinti; PB- Peroneus brevis

## MATERIAL AND METHODS

The aim of our study was to establish the incidence of the PDMQ, its origins, and insertions. One hundred lower limbs of adult (age range, 37- 70 years) cadavers of unknown sex were studied. They were carefully inspected and those lower limbs without any deformities, external trauma and pathology were taken for

study. These lower limbs were in pairs and belonged to the same body. Lateral compartment of each leg was carefully dissected. When the PDMQ was found, its origin, insertion, and diameter was taken with the help of digital vernier caliper that provides accurate resolution up to 0.01 mm. All specimens were photographed by digital camera.

Insertion site	Percentage
1-On the dorsal digital expansion of 5 <sup>th</sup> toe (Fig. 1).	41
2-On extensor tendon (Fig. 2).	19
3- On base of the proximal phalanx of the 5 <sup>th</sup> toe.	16
4- On the 5 <sup>th</sup> metatarsal head.	21
5- Dual insertion: (Fig. 3) a- On shaft of 4 <sup>th</sup> metatarsal and b- On head of 5 <sup>th</sup> metatarsal	03

**Table 1:** Showing various sites of insertion of PDMQ and their percentage.

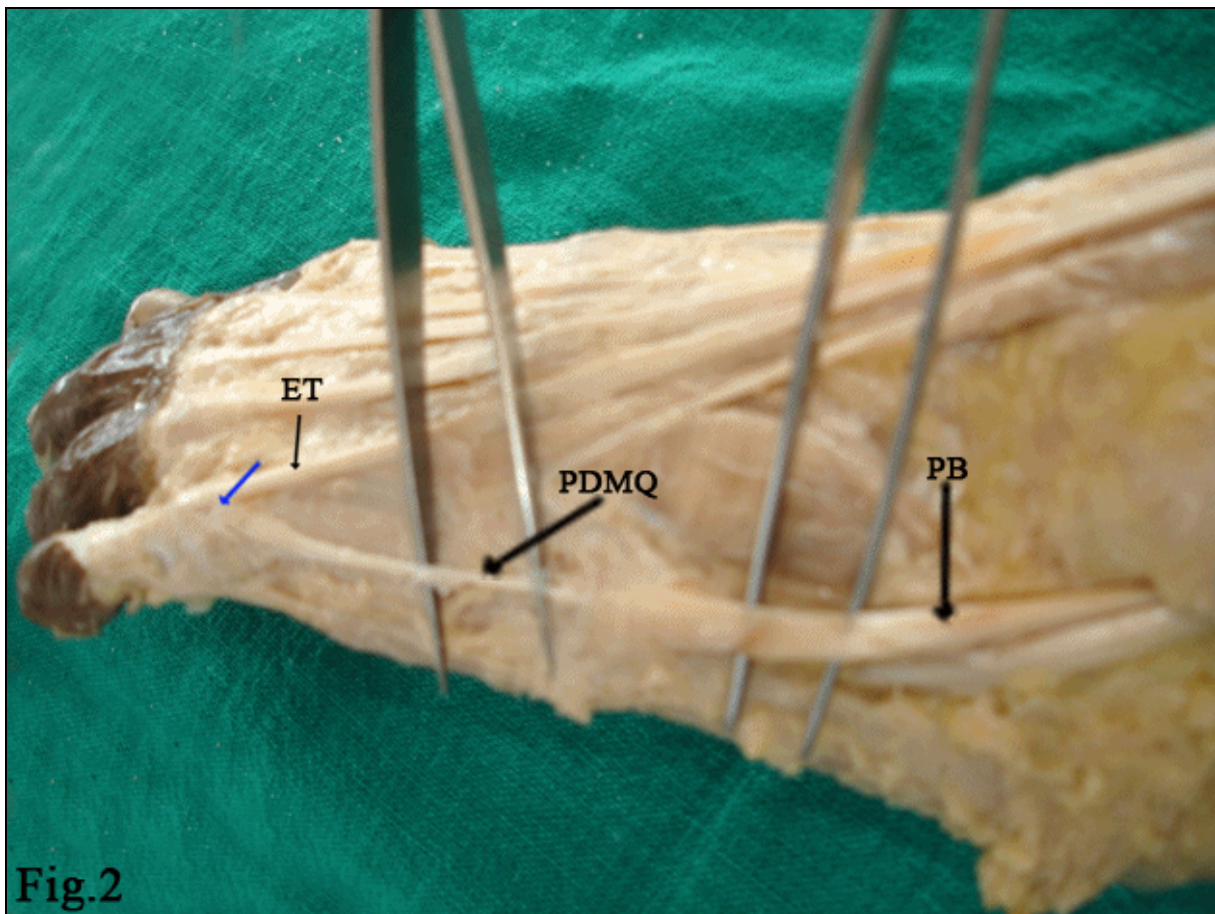
Author	Percentage
Woods, 1868 [n=102]	36
Bhargava et al, 1961 [n=100]	15.5
Reimann, 1981 [n=200]	79.5
Bareither et al, 1984 [n=298]	59.7
Le Double, 1985 [n=100]	34
Present study [n=100]	51

**Table 2:** Comparison of Incidence of PDMQ reported by different authors

## RESULTS

We observed PDMQ muscle in 51 /100 feet which was in the form of a tendinous slip which is extending from the tendon of peroneus brevis (Fig. 1) in all cases. We reported variable insertion sites of PDMQ muscle which are tabulated in Table 1. We didn't observe any variations of peroneal muscles and presence accessory peroneal muscles when PDMQ was present.

- PDMQ was present bilaterally in only 5 cases.
- Prevalence of this muscle was more on left side (35/50 i.e. 70%).
- Size of PDMQ varied from 0.7 mm to 3 mm.
- In 13 cases (i.e. 25.49%) fanned –out fibers of peroneus tertius was forming hood over PDMQ muscle.
- Peroneus tertius muscle was present in 91% of cases.



**Figure 2-** Blue arrow showing insertion of PDMQ on extensor tendon. ET- Extensor tendon, PDMQ- peroneus digiti minimi quinti; PB- Peroneus brevis

## DISCUSSION

The PDMQ muscle is a rare anatomical variation. The prevalence of it is not precisely known. There are only a few studies concerning this muscle. PDMQ was observed by Woods, 1867-1868; Bhargava et al, 1961; Reimann, 1981; Bareither et al, 1984; Le Double, 1985. They reported variable incidence of this muscle (Table 2). But Macalister (1872) and Testut (1921) described it, as a small muscle with its variations in detail. Testut (1921) described it, as a small muscle in mammals in details which is located between peroneus longus and brevis muscles. It is triangular in shape and takes origin from base of fibula. The apex of the muscle continued by tendon and glides over the dorsum of the 5<sup>th</sup> metatarsal and inserts on proximal phalanx of the 5<sup>th</sup> toe.

According to Testut (1921), the PDMQ muscle may appear in man in complete and incomplete form. He subdivided the complete form of PDMQ into three varieties as follow:

- Phalangeal insertion of PDMQ on 5<sup>th</sup> toe, with corresponding independent proximal muscle belly.
- Phalangeal insertion on 5<sup>th</sup> toe with PDMQ muscle fused to the peroneus brevis.
- Phalangeal insertion on 5<sup>th</sup> toe extending as a tendon slip from peroneus brevis tendon and this is most common variation of PDMQ of Huxley. Its insertion may be: on the base of the proximal phalanx of the 5<sup>th</sup> toe, on the 5<sup>th</sup> metatarsal head, shaft or base, on extensor tendon or aponeurosis of 5<sup>th</sup> toe or 4<sup>th</sup> metatarsal shaft.

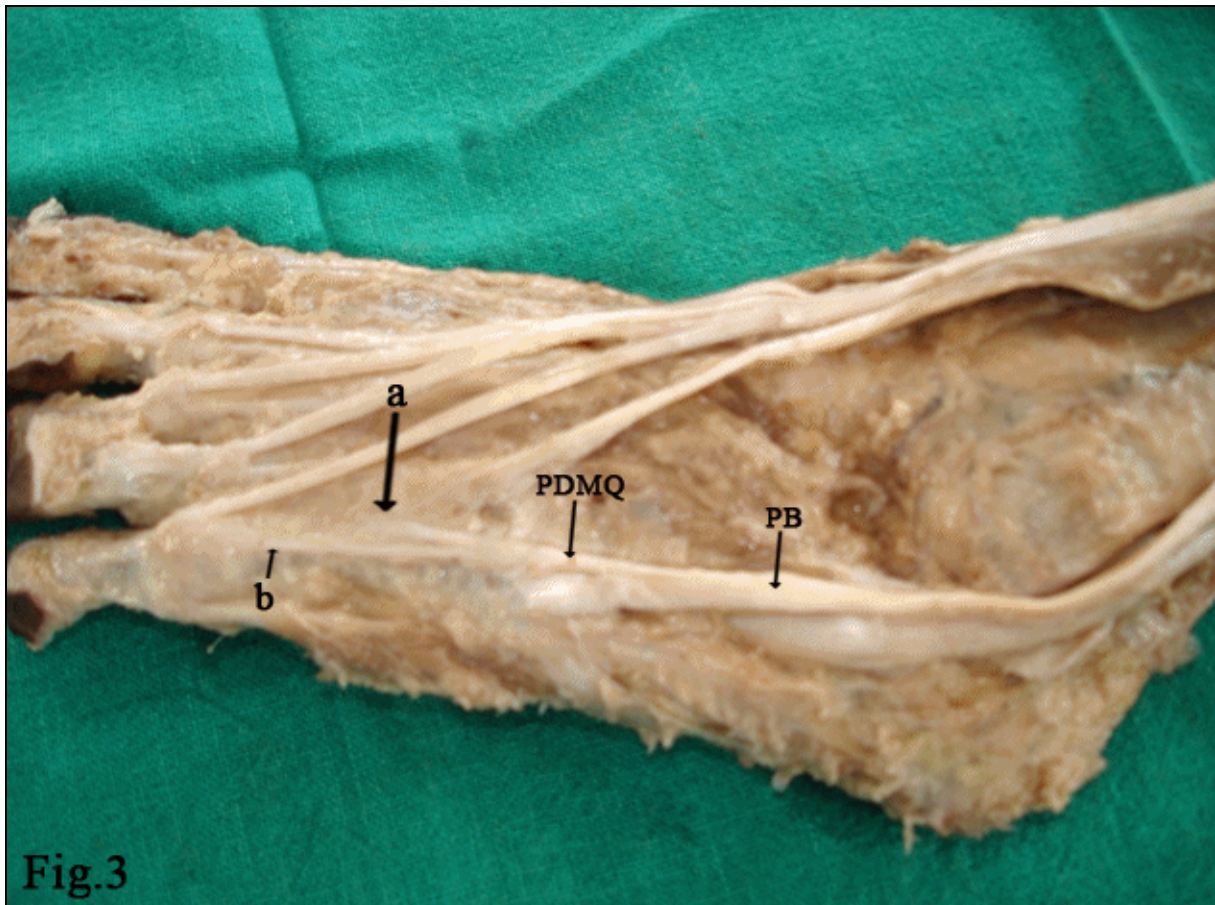
While searching the literature we came across few case reports on PDMQ. Cunningham et al (1887) observed well developed PDMQ muscle in two cases. It was in the form of slender tendinous slip which was extending from peroneus brevis to dorsal digital expansion of 5<sup>th</sup> toe. Sönmez et al (2000) reported this muscle bilaterally during routine dissection in a single case. Though there are very few study reports on incidence of PDMQ, they show wide range of variations

(Table 2). We reported higher incidence of PDMQ muscle in our study when compared with Woods (1867-1868); Bhargava et al (1961) and Le Double (1985), but it is at lower side in comparison with other researchers (Table 2). This may be due to different population which is used for study.

We reported only one subtype of PDMQ muscle with different attachment of its insertion (Table 1). Present study reported dual insertion of this muscle (Fig.3). We observed an interesting finding that fanned – out fibers of peroneus tertius was forming hood over PDMQ muscle in 25.49 %. However, peroneus tertius was present

in 91% of lower limbs. Similar type of description was given by Taser et al (2009) in his paper. They observed a thin tendinous slip extending from peroneus brevis which was covered by fanned out fibers of peroneus tertius.

Some researchers consider a tendinous slip, which detaches from the tendon of the peroneus brevis without a clear muscular belly is considered as a split or double insertion of the peroneus brevis. But, while searching the literature, we came across a detail description of PDMQ by Testut (1921). Therefore, we consider it as a separate muscle rather than the double insertion or split of peroneus brevis.



**Figure 3-** Showing dual insertion of PDMQ. PDMQ- Peroneus digiti minimi quinti; PB- Peroneus brevis; a-insertion on shaft of 4<sup>th</sup> metatarsal; b-insertion on head of 5<sup>th</sup> metatarsal.

Terrence et al (2009) discussed unusual variations in ankle anatomy which may contribute to chronic ankle sprains. For example, sometimes there are extra bony bumps, extra bones, or a slightly displaced muscle belly or

some may have an additional muscle such as the peroneus quartus, peroneus digiti quinti, or peronealcalcaneus and any of these added anatomical features change the dynamics of how the foot works and can contribute to problems.

Present study reported higher incidence of PDMQ muscle. Therefore, awareness of such anatomical variation is important for us as an anatomist as well as for clinicians to diagnose lateral ankle and foot complaints and its use in reconstructive surgery. Also for radiologist to avoid misdiagnosis of a peroneus brevis split tear.

Many authors report that the variation of peroneal musculature may be atavistic structures, as they are found in aneuploid neonates and monkeys (Macalister, 1872). Present study is a humble attempt to highlight the incidence and morphological description of PDMQ in Indian cadavers. As we reported high incidence of PDMQ muscle further studies should be performed to determine its incidence in different population and its role during pronation and any clinical relevance with the help of cadaveric study and new techniques such as USG, MRI, CT which will throw more light on this rare muscle.

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