The Location of Pes Anserinus Insertion in Thai People

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Background: *The semitendinosus and gracilis tendon are commonly used for ligamentous reconstruction. Inaccurate skin incision may cause complications such as cutting the main tendon, inadequate graft length and sciatic nerve injury. There have been no reports about the insertion site of these tendons among Thai people.*
Objective: *To describe the distance between pes anserinus insertion and tibial tuberosity.*
Material and Method: *Eighty five cadaveric knees were dissected. We measured the distance between tibial tuberosity and tendon insertion and collected by the side and sex.*
Results: *The median distance between tibial tuberosity and tendon insertion was 0.5 centimeter at the vertical plane and the horizontal plane below tibial tuberosity was 2 and 2.5 centimeters in female and male, respectively. There was a statistically significant difference of the horizontal plane between male and female (p-value <0.01).*
Conclusion: *The location of pes anserinus insertion in Thai population may be more proximal than previous report.*

Keywords: *Semitendinosus, Gracilis, Pes anserinus insertion*

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The semitendinosus and gracilis tendon are commonly used for ligamentous reconstruction. These tendons are located on the medial side of the knee between layer I and II as described by Warren et al[1]. The insertion blends into a common aponeurosis at the proximal tibia. These structures are covered with sartorial fascia which is called the pes anserinus insertion[2,3]. Complications could occur during the graft harvesting procedure. Sander et al reported saphenous nerve injury after hamstring harvesting[4]. Bertram et al reported a case of saphenous nerve neuralgia associated with a vertical pes anserinus incision for semitendinosus harvesting[5]. Kartus et al reported that surgical incisions placed too close to the tibial tuberosity or the apex of patella may injure the infrapatellar branch of the saphenous nerve[6]. The standard technique used for harvesting the semitendinosus and gracilis tendon requires 3-5 centimeters on medial side of proximal tibia. Because arthroscopic surgery is a minimally invasive procedure, patients expect to have only a small scar. The location of incision influences the direction of tendon stripper or graft harvester. Graft harvesting with a small incision may cause complication if the location of skin incision was too high or low. Therefore, the incorrect location of the skin incision may cause complications such as cutting the main tendon, inadequate graft length and sciatic nerve injury[7]. The anatomic study of the insertion is needed to create an accurate skin incision and provide for more cosmetically. No accurate insertion site of the tendons was reported in Thai people. In this study, we described the average distance between the pes anserinus insertion and tibial tuberosity in Thai people.

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Material and Method

Eighty five cadaveric knee specimens (42 males, 43 females) were obtained from Department of Anatomy,

Faculty of Science, Mahidol University. The knee with previous surgery, any knee deformity and amputation were excluded. For the right knee, there were 21 females and 22 males specimens. The insertion of the tendon was identified through oblique skin incision over the medial side of the proximal tibia. Skin was dissected to expose the whole pes anserinus insertion and tibial tuberosity. We recorded the sex and side of the specimens and measured the distance between tip of tibial tuberosity and the pes anserinus insertion. We used the tip of tibial tuberosity as the highest and most anterior landmark. The distance was described into vertical (A) and horizontal (B) plane in centimeter (Fig. 1).

Because of the data was skewed and not normally distributed, the average distance was described as median and range. We used Wilcoxon rank-sum (Mann-Whitney) test to compare between groups. Fisher's exact test was used to compare categorical data between groups. A p-value < 0.05 was considered statistically significant. All analysis were performed using STATA 10.0 program (stata Corp, Texas).

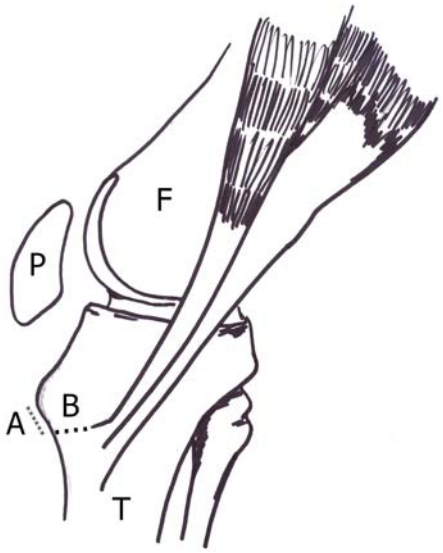

Fig. 1 Distance between tip of tibial tuberosity to the most distal and superior point of pes ancerinus insertion in vertical plane (A) and horizontal plane (B) (Tibia, T; Femur, F; Patella, P)

Results

The median distance was 0.5 centimeter on the vertical plane (A) and 2.5 centimeters on the horizontal plane (B). The median distance B was 2.5 centimeters in males and 2 centimeters in females. There was a statistically significant difference between the groups with (p-value < 0.01) (Table 1). The distance A and B were not different between sides.

Discussion

A single skin incision is routinely used in semitendinosus and gracilis tendon harvesting. It is usually harvested from the distal to the proximal direction. As a result, the incision is always on the proximal tibia. We used tendon palpation to determine the location of the incision for harvesting semi-tendinosus and gracilis tendons[8]. Inaccurate skin incision may have occurred in female or obese patients who had thick adipose tissue at the medial side of the tibia. Solman et al[9] recommended that an incision for harvesting semitendinosus and gracilis tendon for anterior cruciate ligament reconstruction should be centered approximately 4 centimeters medially and just distal to the tibial tuberosity.

The accessory band is thickened fascia which is connected between the semitendinosus and medial head of the gastrocnemius; it may cause complications while harvesting the graft. Before harvesting the graft with the tendon stripper, the accessory band should be excised or freed from the main tendon to prevent premature tendon amputation[10]. The location of the accessory band

Table 1. Median distance between tip of tibial tuberosity and pes anserinus insertion in vertical plane (A) and horizontal plane (B)

	Distance (cm), median (range)			p-value
	Both groups median	Male median	Female median	
Vertical plane (A)	0.5 (0-2)	0.5 (0-2)	0.5 (0-1)	0.82
Horizontal plane (B)	2.5 (1-4)	2.5 (1-4)	2.0 (1-3.5)	<0.01

was 7 to 10 centimeters from the insertion of pes anserinus[10-12]. The proper location of the incision at the proximal tibia should not be far from the accessory band when using single skin incision to harvest the semitendinosus tendon.

The saphenous nerve crosses superficial to the gracilis tendon at the posteromedial joint line. Injury of this nerve can cause paresthesias at the anteromedial area of the lower leg. It divides into two terminal branches which are the infrapatellar and sartorial branches[13]. The saphenous nerve and infrapatellar branch are the most vulnerable to be injured during anterior cruciate ligament reconstruction[4,5,13-17]. Vertical skin incision for harvesting semitendinosus and gracilis tendon have a higher risk of infrapatellar branch injury than horizontal or oblique skin incisions[13,15].

In this study, we revealed the distance of pes anserinus insertion relative to tibial tuberosity in Thai people so we can predict the proper incision. The pes anserinus insertion is located at 2.0 to 2.5 centimeters medial and 0.5 centimeters distal to tibial tuberosity. Although the horizontal distance (B) was statistically different between male and female, it was not clinically significant. In the previous study, Pagnani et al reported the distance between the tibial tuberosity and pes anserinus insertion. The average (A) distance was 1.9 centimeters (range 1.0 to 2.5) and (B) distance was 2.25 centimeters (range 1.3 to 3.0)[3]. The A distance or vertical plane was different from our study. Tillett et al[18] recommended a diagonal incision originating 3 centimeters medial to tibial tuberosity and terminating at a point 3 centimeters distal and 5 centimeters medial to tibial tuberosity. Our results suggested that the incision which was used to harvest these tendons may be more proximal. We used oblique skin incision to avoid saphenous nerve injury and the center of the skin incision should be 4 centimeters medial and 0.5 centimeters distal to tibial tuberosity. This incision was the suitable location because it allows access to the accessory band and the tendon insertion more easily.

Conclusion

The location of the pes anserinus insertion in our study was 0.5 centimeters distal and 2.5 centimeters medial to tibial tuberosity. The distance on the vertical plane was different from the previous study which was demonstrated in Caucasian populations. This study may be useful to improve the accuracy of the skin incision for graft harvesting.

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ตำแหน่งของจุดเกาะเส้นเอ็น *Pes Anserinus* ในชนไทย

ชูศักดิ์ กิจชุณาเสถียร, เฉลิมชัย ลิมิตเลาหพันธุ์, ณัฐพร แสงเพชร, พรจันทร์ สายทองดี, ภัทรวัณย์ วรธนารัตน์

***ภูมิหลัง**: ในการผ่าตัดสร้างเส้นเอ็นใหม่มักจะใช้เส้นเอ็น semitendinosus และ gracilis ตำแหน่งแผลผ่าตัดที่ไม่ถูกต้องจะทำให้เกิดภาวะแทรกซ้อนต่างๆ เช่น เส้นเอ็นขาด เส้นประสาทได้รับบาดเจ็บ ในปัจจุบันยังไม่มีการศึกษาใดที่แสดงตำแหน่งของจุดเกาะของเส้นเอ็นบนกระดูกหน้าแข้งเมื่อเปรียบเทียบกับปุ่มกระดูก tibial tuberosity ในคนไทย*

***วัตถุประสงค์**: เพื่ออธิบายจุดเกาะของเส้นเอ็นบนกระดูกหน้าแข้งเมื่อเปรียบเทียบกับปุ่มกระดูก tibial tuberosity ในผู้ป่วยไทยทั้งชายและหญิง*

***วัสดุและวิธีการ**: ทำการศึกษาในศพ จำนวน 85 เข่า โดยทำการวัดระยะระหว่างปุ่มกระดูก tibial tuberosity และจุดเกาะของเส้นเอ็น ข้อมูลอื่นที่ทำการบันทึก ได้แก่ ข้อมูล เพศ และข้างของเข่า*

***ผลการศึกษา**: พบว่าในแนวดิ่ง จุดเกาะเส้นเอ็นต่ำกว่าปุ่มกระดูกเท่ากับ 0.5 เซนติเมตร และ ในแนวระนาบ เท่ากับ 2 เซนติเมตร ในผู้หญิง และ 2.5 เซนติเมตร ในผู้ชาย นอกจากนี้เพศชายและหญิง มีระยะในแนวระนาบที่มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ*

***สรุป**: จุดเกาะของเส้นเอ็นบนกระดูกหน้าแข้งในกลุ่มตัวอย่าง ที่เป็นคนไทยอาจจะมีตำแหน่งที่สูงกว่าในกลุ่มตัวอย่างที่เป็นชาว Caucasian ที่มีรายงาน และสามารถนำความรู้ที่ได้มาประยุกต์ใช้ในการหาตำแหน่งแผลผ่าตัดในการเก็บเส้นเอ็นได้*