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A Cadaveric Based Morphometric Analysis of The Obturator Nerve in Thigh Region of Malaysian Cadavers

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Abstract
Background: *The obturator nerve is one of the very important nerves of the thigh region, which has importance in the field of Anatomy and in various clinical fields.*
Objective: *This study was the first attempt to analyze the distances of the obturator nerve exit zone (ONEZ) of the obturator foramen (OF), from the various important landmarks of thigh region, involving Malaysian cadavers.*
Materials and methods: *This study was conducted on seventy-eight adult (cadaveric and disarticulated), lower limb specimens of both genders and different ethnicity. All measurements were recorded with the help of digital vernier caliper (DVC).*
Results: *The average distance from the anterior-superior iliac spine (ASIS) to the obturator nerve exit zone (ONEZ) of the obturator foramen (OF) was 107.86 mm ± 6.81 (right) & 106.73 mm ± 6.50 (left). The mean distance from the pubic tubercle (PT) to the ONEZ of OF was 29.99 mm ± 3.90 (right) & 27.05 mm ± 3.50 (left). The mean shortest distance from the inguinal ligament (IL) to the ONEZ of OF was 16.93 mm ± 1.04 (right) & 17.15 mm ± 1.05 (left). The average length of the IL from the ASIS to the point **3** was 93.97 mm ± 6.89 (right) & 95.66 mm ± 6.39 (left). The mean length of IL from the PT to point **3** was 21.24 mm ± 2.79 (right) & 20.99 mm ± 2.13 (left). The average length of the obturator nerve exposed between the ONEZ of OF and the adductor longus (AL) was 38.75 mm ± 3.16 (right) & 40.47 mm ± 2.68 (left). The mean shortest distance from the ONEZ of OF and the femoral artery was 29.71 mm ± 1.03 (right) & 26.33 mm ± 1.07 (left).*
Conclusion: *This knowledge will not only help the future researchers but will also go a long way in assisting the clinicians in preventing iatrogenic nerve injuries.*
Key words: *Obturator nerve, obturator nerve exit zone (ONEZ), obturator foramen (OF), anterior-superior iliac spine (ASIS), pubic tubercle (PT).*

I. Introduction

The obturator nerve is one of the very important nerves of the thigh region, which has importance in the field of Anatomy and in various clinical fields. The anterior branches of the ventral rami of the L2-L4 spinal nerves form the obturator nerve, where the contribution from the L3 is the largest while that from the L2 is the smallest. [1] The origin of the obturator nerve occurs within the psoas major muscle and then it descends through the muscle forming a bundle to get emerged from its medial margin at the pelvic brim. [2, 3] Then it crosses the PB to enter the lesser pelvis. Finally, it reaches the upper part of the obturator canal (OC) lying above and anterior to the obturator vessels by travelling antero-inferiorly in the extraperitoneal fat along the lateral pelvic wall, passing lateral to the internal iliac vessels and the ureter. [1, 4] It divides into anterior and posterior branches in the upper part of the OF to enter the medial side of the thigh. [5]

The anterior division enters the thigh leaving the pelvis anterior to the obturator externus (OE) and passes downwards on the adductor brevis (AB), and deep to the pectineus as well as the AL. [6] At the lower margin of

the AL, it communicates with the saphenous nerve and the anterior cutaneous nerve of the thigh to form the subsartorial plexus and terminates as a filament which passes along the femoral artery.[4] It serves the gracilis, the AB, the AL and sometimes the pectineus (if it is not innervated by the posterior division) by giving muscular branches; and the hip joint by giving articular branches. [5] In addition, it innervates the skin over the medial aspect of the thigh by contributing to the formation of the subsartorial plexus; it also supplies the femoral artery. [5] Near the OF, it gives an articular branch to the hip joint.[1] The posterior division passes through the anterior portion of the OE and descends deep to the AB, lying on the adductor magnus, by which it is separated from the anterior division. [4,6] It provides motor innervation to the OE, the pubic part of the adductor magnus, and sometimes the AB, if the latter is not served by the anterior division; and terminates by passing down through the hiatus magnus, supplying the knee joint.[5]

Since there aren't many such studies published involving the Malaysian cadavers, the current study was aimed to investigate the different dimensions of the obturator nerve in the thigh region of the Malaysian cadavers with relevant clinical consequences.

II. Methodology & Materials

This was a cross sectional & observational study and was conducted in the Unit of Anatomy, Faculty of Medicine of AIMST University, Kedah, Malaysia and University Kebangsaan Malaysia (UKM), Selangor, Malaysia during the period from June 2018 to February 2019. The present study had been carried out on 78 properly embalmed adult lower limb specimens (12 cadavers and 54 disarticulated lower limbs) of both genders (4 disarticulated female lower limbs and rest were male specimens) and different ethnicity, obtaining from the units of Anatomy, AIMST University, Kedah, Malaysia; University Kebangsaan Malaysia (UKM), Selangor, Malaysia.

These were the following criteria for the samples to be eligible for our study: a) Properly embalmed and well-preserved specimens; b) Adult lower limb specimens; c) The specimens of both genders and different ethnicity; And a) Distorted limbs; b) Disrupted nerves at any level of their course; c) Destroyed surrounding structures such as muscles, vessels were excluded from our study.

Procedures for the preservation of specimens: All the specimens were properly embalmed by 10% Formalin solution, phenol, alcohol, and glycerin.

Procedures for exposure of the obturator nerves: The limbs were dissected in accordance with Cunningham's Manual of Practical Anatomy, and the research sections were appropriately exposed. All measurements were taken in accordance with the following description, with particular attention to any relevant bone landmarks and the surrounding tissues and nerves.

Methods of dissection for the obturator nerve: For the present study, the anatomically important structures include the ASIS, the PT, the IL, the femoral artery, and the AL. [3] The anterior abdominal wall was incised and the locations of the external iliac artery, vein, and femoral nerve were defined and protected.[7] The skin and the subcutaneous tissues of the anterior and medial thigh regions were removed after positioning the specimen's supine. The pectineus and AL muscles were dissected with great care at their fascial septum and were incised in a transverse pattern to expose the AB and OE muscles lying at a deeper level. The pectineus muscle was exposed by detaching the soft tissue carefully from the femoral artery and the fascia lata. The OF and obturator nerve were accessed by sacrificing the pectineus muscle. All other adjacent structures were left intact. [3] The site of the division of the common obturator nerve into the anterior and posterior branches was pointed with special attention. The anterior branch was found within the connective tissue sheath of the AB. After careful dissection and anterolateral removal of the AB, the posterior branch was exposed. [8]

Parameters:

1. The distance from the ASIS to the ONEZ of the OF (mm) - (right and left sides). [Figure 1.1]
2. The distance from the PT to the ONEZ of the OF (mm)- (right and left sides). [Figure 1.2]
3. The shortest distance from the IL to the ONEZ of the OF (mm) - (right and left sides). [Figure 1.3]
4. The length of the IL from the ASIS to the point 3 (mm) - (right and left sides). [Figure 2.1]
5. The length of the IL from the PT to point 3 (mm) - (right and left sides). [Figure 2.2]
6. The length of the obturator nerve exposed between the ONEZ of the OF and the AL (mm) - (right and left sides). [Figure 3.1]
7. The shortest distance from the ONEZ of the OF and the femoral artery (mm) - (right and left sides). [Figure 3.2]
8. The width (diameter) of the obturator nerve at the OF (mm) - (right and left sides). [Figure 4.1]
9. The thickness of the obturator nerve at the OF (mm) - (right and left sides). [Figure 4.2]
10. The circumference of the obturator nerve at the OF (mm) - (right and left sides). [Figure 4.3]

Methods of studying the parameters:

The distance from the ASIS to the ONEZ of the OF (mm) - (right and left sides)

The ASIS was palpated and marked by a colourful pin, then the distance between the pinned point and the ONEZ at the OF was measured by DVC. [Figure 1.1]

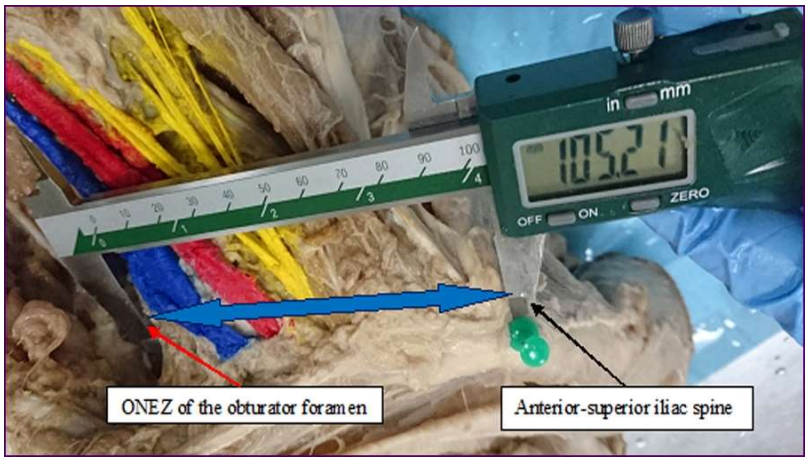


Figure 1.1: Measurement of the distance from ASIS to the ONEZ of the OF

The distance from the PT to the ONEZ of the OF (mm) - (right and left sides)

The PT was determined by palpation and marked by a colourful pin, after that the distance between the marked point and the ONEZ of the OF was measured by DVC. [Figure 1.2]

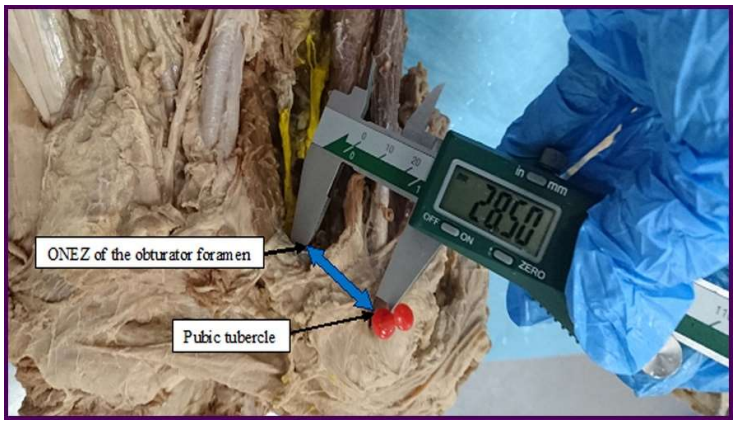


Figure 1.2: Measurement of the distance from the PT to the ONEZ of the OF

The shortest distance from the IL to the ONEZ of the OF (mm) - (right and left sides)

The point of IL at the shortest distance with the ONEZ of the OF has been marked by a colourful pin, then the distance between the pin and the ONEZ was measured by DVC. [Figure 1.3]

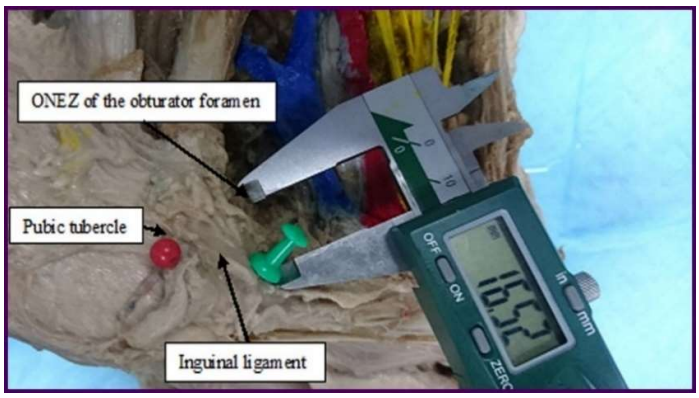


Figure 1.3: Measurement of the shortest distance from the IL to the ONEZ of the OF

The length of the IL from the ASIS to the point 3 (mm) - (right and left sides)
The distance between the colourful pins inserted into the ASIS and point 3 had been measured by DVC. [Figure 2.1]

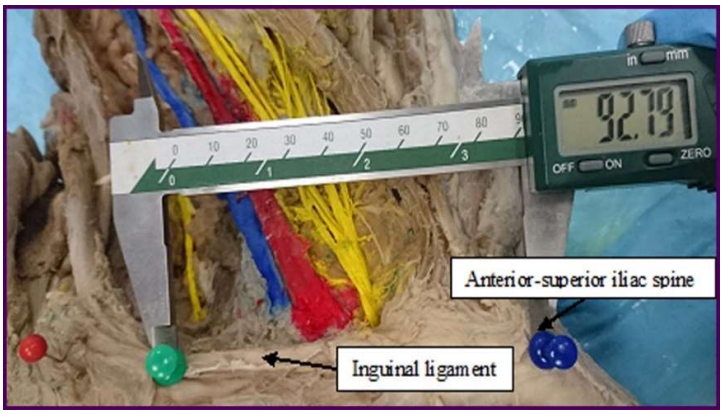


Figure 2.1: Measurement of the length of the IL from the ASIS to the point 3

The length of the IL from the PT to point 3 (mm) - (right and left sides)
The distance between the pins inserted into the PT and point 5 had been recorded by DVC. [Figure 2.2]

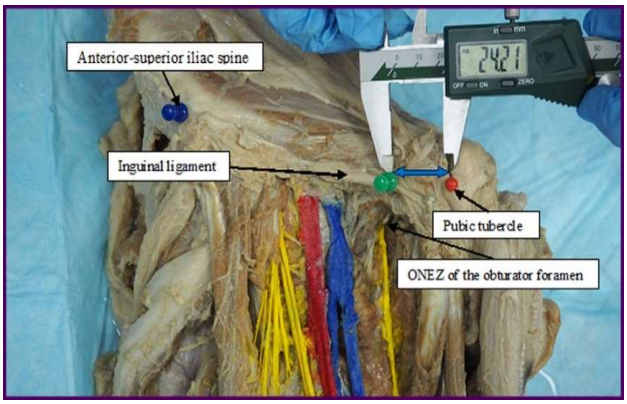


Figure 2.2: Measurement of the length of the IL from the PT to point 3

The length of the obturator nerve exposed between the ONEZ of the OF and the AL (mm) - (right and left sides)
The length of the obturator nerve exposed between the ONEZ of the OF and the AL was measured by DVC. [Figure 3.1]

Figure 3.1: Measurement of the length of the obturator nerve exposed between the ONEZ of the OF and the AL

The shortest distance between the femoral artery and the ONEZ of the OF (mm) - (right and left sides)
The point of the femoral artery at the level of the ONEZ of the OF was determined and marked by a colorful pin, and the distance between the pinned point and the ONEZ of the obturator foramen had been recorded by DVC. [Figure 3.2]

Figure 3.2: Measurement of the shortest distance between the femoral artery and ONEZ of the OF

The width (diameter) of the obturator nerve at the OF (mm) - (right and left sides)
The width of the nerve at the mentioned point had measured by DVC. [Figure 4.1]

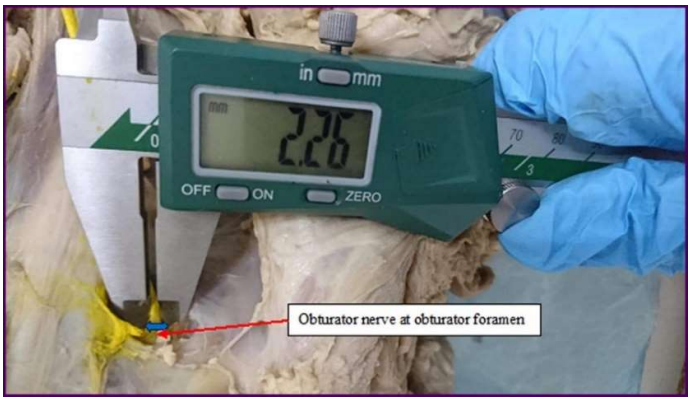


Figure 4.1: Measurement of the width of the obturator nerve at the OF

The thickness of the obturator nerve at the OF (mm) - (right and left sides)

The thickness of the obturator nerve at the OF was measured by DVC. [Figure 4.2]

Figure 4.2: Measurement of the thickness of the obturator nerve at the OF

The circumference of the obturator nerve at the OF (mm) - (right and left sides)

The circumference of the obturator nerve at the OF was recorded by a thread and the specific point was marked; the marked area of the thread had been measured by DVC. [Figure 4.3]

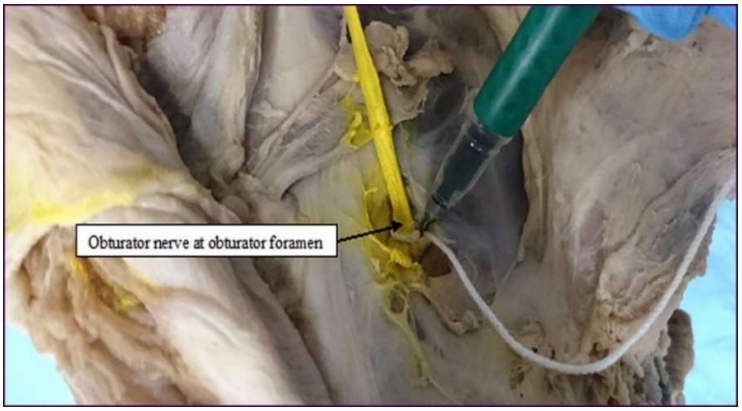
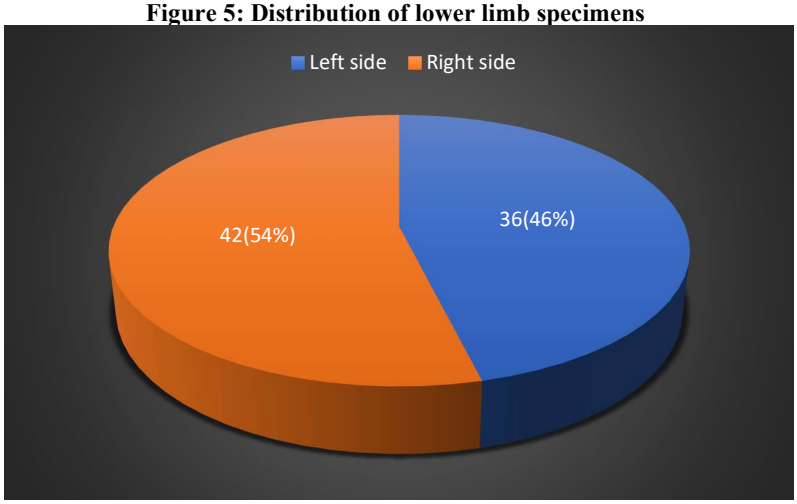


Figure 4.3: Measurement of the circumference of the obturator nerve at the OF

Statistical Analysis: All the data had been analyzed statistically by using SPSS 22nd version. Mean and standard deviation were calculated properly for all the studying parameters and the mean values for the right and left sides were compared by independent samples 't' test, predicting some statistically significant differences between the mean values of right and left lower limbs for some parameters, because the examined nerves were obtained from different cadaveric and disarticulated lower limbs of different heights, genders and ethnicity. The study was approved by the Ethical Review Committee of AIMST University, Kedah, Malaysia and University Kebangsaan Malaysia (UKM), Selangor, Malaysia.

III. Results

Figure 5: Distribution of lower limb specimens



The pie chart shows that among the 78 lower limb specimens, 42 were of the right side and remaining 36 were of the left side. The obturator foramens were properly accessed. All the studied obturator nerves were properly dissected and exposed. The structures of close vicinity such as the blood vessels, muscles, other nerves, and bony landmarks were intact. No variation was observed.

Table 1.1: The distance from the ASIS to the ONEZ of the OF (mm) - (right and left sides)

Limb type	Distance from ASIS to the ONEZ of the OF		
	Mean	SD	Sig. 2-tailed
Right	107.86 mm	6.81	0.46
Left	106.73 mm	6.50	

As per table 1.1, the mean values found as 107.86 mm ± 6.81 (right) and 106.73 mm ± 6.50 (left), ranging from 93.03 - 119.68 mm (right) and 95.22 - 119.41 mm (left). The 'p' value was 0.46 (>0.05). So, there was no statistically significant difference between the values of right and left limbs.

Table 1.2: The distance from PT to the ONEZ of the OF (mm) - (right and left sides)

Limb type	Distance from PT to the ONEZ of the OF		
	Mean	SD	Sig. 2-tailed
Right	29.99 mm	3.90	0.001
Left	27.05 mm	3.50	

As described in the table 1.2, the average distance from PT to the ONEZ of the OF was 29.99 mm ± 3.90 (22.65 - 37.95 mm) for the right side and 27.05 mm ± 3.50 (21.67- 37.02 mm) for the left side. The 'p' value was 0.001 (<0.05) which means there was a statistically significant difference in the distance from the PT to the ONEZ of the OF between the right and left sides.

Table 1.3: The shortest distance from the IL to the ONEZ of the OF (mm) - (right and left sides)

Limb type	The shortest distance from the IL to the ONEZ of the OF		
	Mean	SD	Sig. 2-tailed
Right	16.93 mm	1.04	0.35
Left	17.15 mm	1.05	

The table 1.3 describes the average shortest distance from the IL to the ONEZ of the OF was 16.93 mm ± 1.04 (14.56 - 18.62 mm) for the right and 17.15 mm ± 1.05 (15.08 - 19.49 mm) for the left limbs. The 'p' value was

0.35 (>0.05). Which indicates of having no statistically significant difference between the mean values of the both sides.

Table 2.1: The length of the IL from the ASIS to the point 3 (mm) - (right and left sides)

Limb type	The length of the IL from the ASIS to the point **3**		
	Mean	SD	Sig. 2-tailed
Right	93.97 mm	6.89	0.27
Left	95.66 mm	6.39	

As displayed in the table 2.1, the mean length of the IL from the ASIS to the point **3** was 93.97 mm ± 6.89 (79.69 - 109.67 mm) for the right limbs and 95.66 mm ± 6.39 (84.15 - 108.84 mm) for the left limbs. The 'p' value was 0.27 (>0.05), which means there was no statistically significant difference between the values of right and left limbs.

Table 2.2: The length of the IL from the PT to the point 3 (mm) - (right and left sides)

Limb type	The length of the IL from the PT to the point **3**		
	Mean	SD	Sig. 2-tailed
Right	21.24 mm	2.79	0.66
Left	20.99 mm	2.13	

As per table 2.2, the average length of the IL from the PT to the point **3** was found as 21.24 mm ± 2.79 (15.55 - 27.18 mm) for the right side and 20.99 mm ± 2.13 (15.63 - 26.53 mm) for the left side. The 'p' value was 0.66 (>0.05). So, there was no statistically significant difference between the average values of the right and left sides.

Table 3.1: The length of the obturator nerve exposed between the ONEZ of the OF and the AL (mm) - (right and left sides)

Limb type	The length of the obturator nerve exposed between the ONEZ of the OF and the AL		
	Mean	SD	Sig. 2-tailed
Right	38.75 mm	3.16	0.01
Left	40.47 mm	2.68	

As showed in the table 3.1, the average length of the obturator nerve exposed between the ONEZ of the OF and the AL was 38.75 mm ± 3.16 (33.11 - 45.28 mm) for the right side and 40.47 mm ± 2.68 (34.51 - 46.73 mm) for the left side. The 'p' value was 0.01 (<0.05). So, the mean values between the right and left limbs were statistically different.

Table 3.2: The shortest distance from the ONEZ of the OF to the femoral artery (mm)

Limb type	The shortest distance from the ONEZ of the foramen to the femoral artery		
	Mean	SD	Sig. 2-tailed
Right	29.71 mm	1.03	0.00
Left	26.33 mm	1.07	

The table 3.2 describes the average shortest distance from the ONEZ of the OF to the femoral artery was 29.71 mm ± 1.03 (27.91 - 31.73 mm) for the right and 26.33 mm ± 1.07 (24.62 - 28.71 mm) for the left limbs. The 'p' value was 0.00 (<0.05). So, which reflects of having a statistically significant difference between the mean values of the both sides.

Table 4.1: The width (diameter) of the obturator nerve at the OF (mm) - (right and left sides)

Limb type	The width of the obturator nerve at the OF		
	Mean	SD	Sig. 2-tailed
Right	1.95 mm	0.31	0.04
Left	1.83 mm	0.21	

The mean width of the obturator nerve at the OF was 1.95 mm ± 0.31 (1.18 - 2.69 mm) and 1.83 mm ± 0.21 (1.48 - 2.40 mm) for the right and left sides, respectively. The 'p' value was 0.04 (<0.05). So, the average width of the obturator nerve at the OF was statistically different in right and left sides. [Table 4.1]

Table 4.2: The thickness of the obturator nerve at the OF (mm) - (right and left sides)

Limb type	The thickness of the obturator nerve at the OF		
	Mean	SD	Sig. 2-tailed
Right	0.87 mm	0.11	0.13
Left	0.90 mm	0.07	

The average thickness of the obturator nerve at the OF was 0.87 mm ± 0.11 (0.56 - 1.07 mm) and 0.90 mm ± 0.07 (0.75 - 1.05 mm) for the right and left sides, respectively. The 'p' value was 0.13 (>0.05). So, there was no statistically significant difference between the mean values of the right and left sides. [Table 4.2]

Table 4.3: The circumference of the obturator nerve at the OF (mm) - (right and left sides)

Limb type	The circumference of the obturator nerve at the OF		
	Mean	SD	Sig. 2-tailed
Right	8.63 mm	0.51	0.00
Left	8.00 mm	0.73	

The mean circumference of the obturator nerve at the OF was 8.63 mm ± 0.51 (7.38 - 9.55 mm) and 8.00 mm ± 0.73 (7.11 - 9.38 mm) for the right and left sides, respectively. The 'p' value was 0.00 (<0.05), which means there was a statistically significant difference in the circumference of the obturator nerve at the obturator foramen between right left sides. [Table 4.3]

IV. Discussion

In the current study, the topography and different dimensions of the obturator nerve had been examined around the OF. As the obturator nerve block is routinely performed at the region of the OF before its division, this region has become clinically important. Although sufficient cadaveric studies have been performed on femoral and sciatic nerves, there is a paucity of these studies on the obturator nerve. The normal and variant anatomy of the obturator nerve around the OF is extremely important for the clinicians.

The present study was based on different bony landmarks and other surrounding structures to identify the obturator nerve at the OF. To determine the obturator nerve landmarks around the OF, (Jo et al., 2016) performed a study dissecting 28 lower limbs from 14 adult cadavers.[3] The distance between ASIS and ONEZ of the OF was found to be slightly wider in the study conducted by Jo et al. (2016), where the mean value was 113.4 mm ± 6.5 for the right and 114.2 mm ± 7.4 for the left side. [3] However, the distance from the PT to the ONEZ of the OF was identical to that of the Jo et al. (2016), where the values were 30.5 mm ± 4.4 (right) and 30.3 mm ± 5.4 (left). The shortest distance from the IL to the ONEZ of the OF also resembled the Jo et al. (2016)'s study, where the mean values were 18.5 mm ± 3.2 and 19.7 mm ± 5.2 for the right and left sides, respectively. In another study, Kendir et al. (2008) examined 11 cadavers in order to describe the detailed anatomy of the obturator region and OC to define the exact anatomical positions of different structures entering and exiting the OC; as well as the accurate position of the obturator nerve and its branches and its relation with the surrounding structures. [7] Kobayashi et al. (1991) measured the depth of obturator nerve and that of the PT. There was a positive correlation between the obesity index and the depth of the nerve as well as the PT. However, obesity index was not correlated with the difference of the depth of obturator nerve and that of the PT.[9] Erbil et al. (1999) found a case where the obturator nerve was formed by the union of the L1, L2 and L3 spinal nerves on the right side of a cadaver.[10] Gandhi et al. (2013) reported a case where fibres from the L5 root contributed to the formation of obturator nerve along with other usual roots. [11]

In the present study, the mean length of the IL from the ASIS to the point **3** was a bit shorter than the mean values reported by Jo et al. (2016), where the lengths were 106.2 mm ± 4.2 (right) and 99.6 mm ± 7.7 (left). [3] Similarly, this study had also shown that the average length of the IL from the PT to the point **3** was found to be slightly shorter than that of Jo et al. (2016), (24.9 mm ± 5.1 for right and 23.7 mm ± 4.1 for left). Interestingly, Jo et al. (2016) reported the average length of the obturator nerve exposed between the (ONEZ) of the OF and the AL as 41.2 mm ± 6.9 and 41.0 mm ± 3.8 for the right and left sides, respectively, which showed similarity with that of the present study.[3] Similarly, the mean shortest distance from the ONEZ of the OF to the femoral artery matched with the findings of Jo et al. (2016) (30.0 mm ± 5.4 and 25.8 mm ± 3.9 for the right and left sides, respectively).[3] Kendir et al. (2008) mentioned the mean length and width of the nerve at the region of the OC as 5.6 mm ± 0.4 and 1.1 mm ± 0.1, respectively.[7] In the present study, the nerve was found to be wider at the OF. Aiming to measure the different dimensions of all the major nerves of the thigh, the current study also

measured the thickness and circumference of the obturator nerve at the OF, which have not yet reported in the previous literature.

In the anaesthetic procedure, the PT can be used as a landmark to reach the OF. Alternatively, the needle can also be inserted at the proximal tendon insertion of the AL and proceed towards the ASIS. [12] As the nerve is difficult to locate, electronic stimulation is the most accurate technique for the location of the obturator nerve.[13] Locher et al. (2008) conducted a study involving 10 cadavers, dissecting 4 of them bilaterally and aiming to define an injection technique based on an anatomical investigation and a MRI analysis. They found the median distance between the projection of the obturator nerve to the skin on the sagittal plane and the PT and PS was 2.5 cm (1.0-3.8) and 5.4 cm (4.6-6.5), respectively. The nerve was located 2.0 cm (1.5-2.8) deeper to the superior ramus of the pubis. In the MRI analysis, it was revealed that a skin points of entry close to the 25th percentile of the distance between the projection of the nerve to the skin and PT (2.3 cm) or PS (5.1 cm) is associated with a very low risk of the vessel puncture. They considered this method as an efficient and safe procedure in the identification of the nerve in clinical practice. [14]

Tubbs et al. (2005) recorded the mean distance between the obturator nerve and the midline and found the nerve to lie 3 cm away from the midline. [15] A study was conducted by Anagnostopoulou et al. (2009) to provide a detailed description of the variability in the branching pattern of the obturator nerve among 84 cadavers in the IL. In addition, in 20 cases, they performed an ultrasound examination of the inguinal region to locate the nerve properly. They summarized that the point of division for the nerve into the anterior and posterior branches was intrapelvic in 23.22%, within the OC in 51.78% and in the medial side of the thigh in 25% of investigated cadavers. [8]

Anloague and Huijbregts (2009) found a small nerve arising from the anterior divisions of the L3 and L4 nerves, an accessory obturator nerve, was found in 8.8% of the plexuses, exiting over the superior pubic ramus.[16] While presenting a case report, Akata et al. (1999) stated that the presence of some anatomical variant of the, such as an accessory obturator nerve or its abnormal branching can trigger an unexpected stimulation of the nerve even with prior blockade while performing transurethral surgeries.[17] Paying a special attention to the relationship of the posterior division of the obturator nerve to the surrounding structures, Kumka (2010) concluded that the posterior division of the obturator nerve is vulnerable to get compressed at different sites, such as – a) within the OC, b) in a fibro-muscular canal forming by the anterior surface of the obturator membrane and the posterior surface of the OE, c) where it perforates the OE and d) beneath the pectineus and AB muscles.[18]

To ensure the safe surgical and anaesthetic procedures, the anatomy of the OF should be very clear to the clinicians. The site of the division of the nerve and the relations in the OF with other structures are becoming immensely important for the successful blockades. The obturator nerve block should be performed at the OC or at its external orifice to ensure complete analgesia.[7]

Limitations of the study

The sample size wasn't particularly large. The study only included 12 cadavers and the others were disarticulated lower limbs. Due to the shortage of female cadavers, the study only included four disarticulated female lower limbs from two female cadavers. Moreover, there were racial differences in the cadavers. The comparison of the findings between various racial groups in Malaysia was not performed.

V. Conclusion

This study collated measures, paths, and relationships of the obturator nerve in the thigh region of the Malaysian cadavers. It also included the distances from surrounding bony landmarks. Very few studies in this subject have been reported in the literature. This project will therefore provide a quantitative database for the anesthesiologists, surgeons, neurologists, and orthopaedicians. This work helped to clarify the topographical structure of the obturator nerve in respect to the surrounding bony landmarks and improved our understanding of the nerve's morphology as well. In conclusion, it can be understood that although the obturator nerve is more superficially positioned and easier to find, surgeons and anesthetists performing clinical procedures should have a thorough understanding of its width, thickness, circumference, and relationships with adjacent tissues.

VI. Recommendations

Although multiple cadaveric research on the various thigh nerves have been documented, there are incredibly few studies on the Malaysian population published in medical journals. Thus, more study using Malaysian cadavers is ought to be taken into account. Studies can be conducted with larger numbers of cadavers, especially the female cadavers, allowing the comparisons between the two genders.

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