The anatomical relationship of the common peroneal nerve to the proximal fibula and its clinical significance when performing fibular-based posterolateral reconstructions

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Abstract

Purpose: The common peroneal nerve (CPN) can be injured during fibular-based posterolateral reconstructions due to its close relationship to the neck of the fibula. Therefore, the purpose of this study was to observe the course of the CPN and its branches around the fibular head and neck and quantify the position in relation to relevant bony landmarks and observe the relation between tunnel drilling for posterolateral corner reconstruction and both the tunnel entry and exit at the proximal fibula and the CPN and its branches was observed.

Methods: In 101 (mean age = 70.6 ± 16 years) embalmed cadaver knees, the relationship between bony landmarks (tibial tuberosity, styloid process of fibula (APR)) and the CPN and its branches were established and 8 (M1–M8) distances from these landmarks measured; mean, SD and 95% CI were recorded. In 21 of these knees, a fibula tunnel was drilled as in PLC reconstruction and the association of the CPN and its branches to the tunnel entry and exit were judged by two independent observers. Fisher's exact test of independence was used to determine significant differences between genders. Tunnel intersection was analysed in a binary yes/no fashion and was described in frequencies and percentages.

Results: The mean distance from the APR to where the CPN reaches the fibula neck (M1) was 31.4 ± 8.9 mm (CI:29.8–33.0); from the apex of the styloid process (APR) to where the CPN passes posterior to the broadest point of the fibular head (M3) was 21.7 ± 12.6 mm

(CI:19.4–24.0); from the apex of the APR to the most proximal point of the CPN/CPN first branch in the midline of the fibular head (M2) was 37.0 ± 6.7 mm (CI: 35.4–37.7). Out of the 21 randomly selected knees for drilling, the first branch of the CPN was damaged at the tunnel entry point in 7 (33%), and in 5 knees (24%), the CPN was damaged at the tunnel exit. In one knee, at both the tunnel entry and exit, the first branch of the CPN and the CPN were intersected, respectively.

Conclusion: The results of this study strongly suggest that the CPN is at risk when drilling the fibula tunnel performing fibula-based posterolateral corner reconstructions. The total injury rate was 57% with a 33% incidence of injury to the first branch of the nerve at the tunnel entry and 24% to the CPN at the tunnel exit.

Clinical Relevance: Due to the high incidence of injury, percutaneous placement of guide pins and tunnel drilling is not recommended. The nerve should be visualized and protected by either a traditional open approach or minimally invasive techniques. With a minimally invasive approach, the nerve should be identified at the fibula neck and then followed ante- and retrograde.

Keywords: Iatrogenic nerve injuries; Common peroneal nerve; Posterolateral corner reconstructions; Minimally invasive surgery; Proximal fibula

Introduction

Posterolateral corner (PLC) injuries can be devastating and often associated with injuries to other knee ligaments, articular cartilage, menisci and neurovascular structures [1]. Historically, PLC injuries were often treated with primary repair and cast immobilization [2,3,4]. Higher failure rates with primary repair resulted in a trend towards surgical reconstruction [2, 5, 6].

Several PLC reconstruction techniques have been described including one-tailed or two-tailed graft techniques [6]. Both techniques are similar and are based on creating a tunnel in the fibula head from anterolateral to posteromedial by using standardized cannulated reamers [7, 8]. Recent studies have mainly focussed on surgical techniques and functional outcomes of anatomical and isometric reconstruction of the main three structures of the PLC: the lateral collateral ligament (LCL), popliteus tendon (PT) and popliteofibular ligament (PFL) [7, 9,10,11,12,13,14]. The open posterolateral approach has been described as the standard technique [7, 15, 16], but minimally invasive techniques have also gained popularity [8, 17]. Minimally invasive techniques, and perhaps open techniques, put the common peroneal nerve (CPN) at risk, and injuries have been reported with stab incisions and percutaneous fracture fixations [18, 19].

The CPN is susceptible to injury in the region of the fibula head because of its fixed attachment [19, 20] and anatomic variability. At the head of the fibula, the CPN curves laterally around the neck of the fibula and is fixed to the bone via connective tissue, essentially forming the floor of the fibular tunnel [20]. The CPN exits the fibular tunnel then runs deep to the peroneus longus muscle where it divides into the deep and superficial peroneal nerves [20]. Deutsch et al. have shown that in 81% of their sample, the CPN divided distal to the fibular neck, proximal to the fibular neck in 10% and in 9%, division was observed distal to the knee joint but proximal to the fibular neck [21]. Watt et al. found several different branching patterns of the CPN around the fibular head, with the most common being reported as a Type III, which showed branching of the deep peroneal nerve before entering the anterior intermuscular septum [22]. The authors also noted the presence of the recurrent articular nerve, which is the first branch of the CPN, and it is closely associated with the head of the fibula and course together with the anterior tibial recurrent artery. The recurrent articular nerve innervates the superior tibiofibular joint and the anterolateral part of the knee joint capsule.

The purpose of this study was to observe the course of the CPN and its branches around the fibular head and neck and quantify the position in relation to relevant bony landmarks and observe the relation between tunnel drilling for posterolateral corner reconstruction and both the tunnel entry and exit at the proximal fibula and the CPN and its branches was observed.

Methods

Study design

This project was designed as a cross-sectional, quantitative study. Formalin-preserved cadaveric specimens were obtained from the Department of Anatomy, University of Pretoria, South Africa. These specimens were used during the basic anatomy courses for medical students offered by the department. These embalmed cadavers are used for training and research and comply with all the requirements set out in the National Health Act 63 of 2003. Prior to the course, specimens were dissected by two independent researchers and the lateral structures of the knee were exposed. This study was approved by the Research Ethics Committee of the Faculty of Pretoria. A total of 116 knees from 56 males and 59 females were utilized in this study. There were 59 left and 57 right knees. The mean age of the donors was 70.6 ± 16 years of age (range 21–94 years). Specimens were excluded if they showed any visible signs of trauma, previous surgery or any other pathology to the knee region. Specimens were also excluded if any signs of macroscopic damage that occurred during the preservation process were observed.

Dissection technique and measurements:

The whole cadaver was placed in a supine position on a metal dissection table, and the knee was propped up on a wooden block to allow for 90 degrees of flexion. The flexion angle was checked with a goniometer with the axis located at the lateral epicondyle of the femur, the stationary arm along the femur with the apex aimed to the greater trochanter and the movement arm along the fibula aimed to the lateral malleolus [23]. This technique has been reported to be reliable and valid a standard error on 1.5 degrees [23]. The skin was reflected and the underlying soft tissue exposed. The CPN and its branches were then carefully exposed at the fibula neck taking great care not to disturb the normal anatomical relationships. The overlying peroneus longus and brevis and proximal muscle fibres of the tibialis anterior were carefully removed. Great attention was taken not to damage the branches of the CPN. Following exposure, the bony landmarks of fibula head, neck and styloid process were cleaned of any attachments to allow visualization. In particular, the biceps femoris attachment was removed from the styloid process. After exposure pins were placed at the following points (Figs. 1 and 2):

- The midpoint of the tibial tuberosity (1).
- Apex of the styloid process of the fibula (2).

- The point where the CPN reached the head of fibula (4): this was observed as the first site where the CPN made actual contact with the head of the fibula along its course to the neck.
- The point where the CPN reached the neck of the fibula (5).
- The point where the recurrent articular branch of the CPN reached the midline/midpoint of the fibular neck (6).
- The point where the CPN reached the widest point of the fibular head posteriorly (posterior to 4).
- The point where the CPN reached the widest point of the fibular head anteriorly (between 4 to 6).

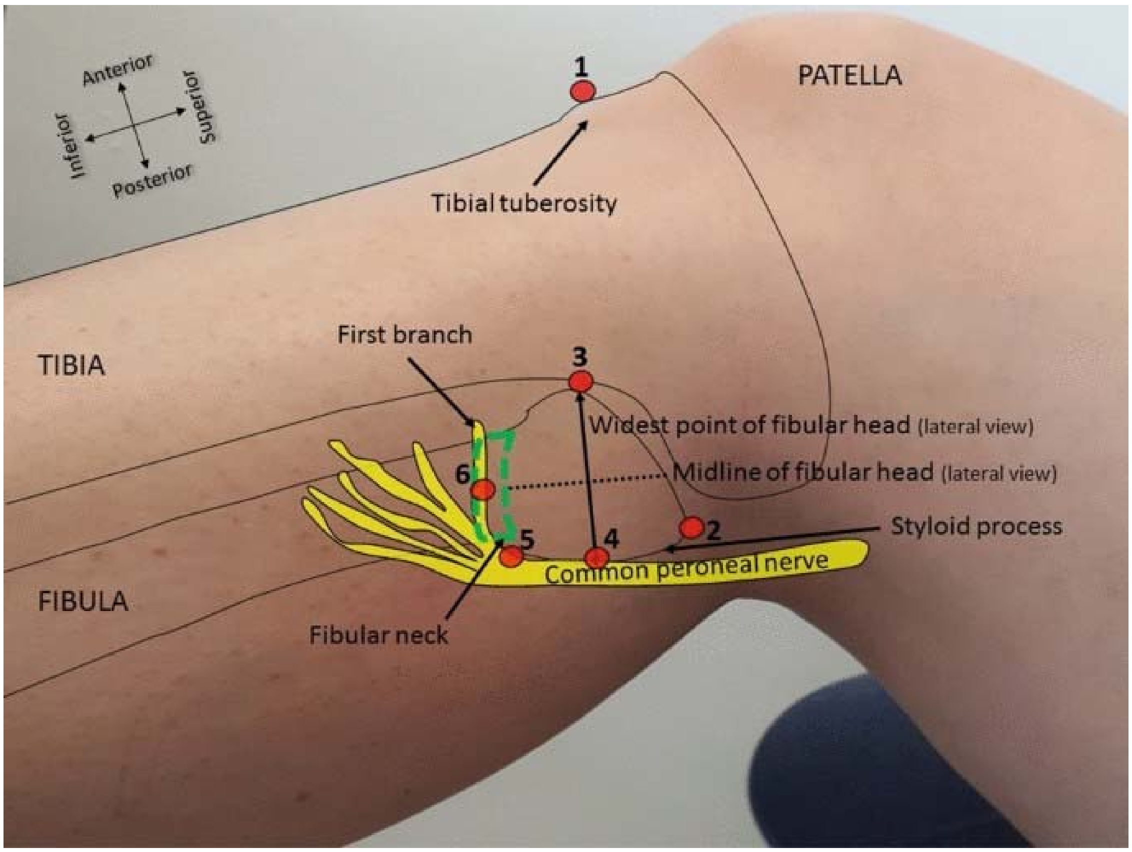

Fig. 1. Projection of the bony landmarks and the course of the common peroneal nerve onto a left knee photograph. (1) is the midpoint of the tibial tuberosity; (2) the apex of the styloid process of the fibula; (3) the most anterior point of the fibular head; (4) the most posterior point of the fibular head; (5) the point where the CPN reached the neck of the fibula; (6) midline point of the fibula head/neck junction

Fig. 2. Cadaver photograph of a left knee. The markers (4–6) were placed where the CPN reached the head of the fibula (4), neck of the fibula (5) and the point where the first branch of the CPN (anterior tibial recurrent nerve) reached the fibular neck. The markers (1–3) marked the tibial tuberosity(1), radial styloid of the fibula head (2) and most anterior point of the fibula head

The following measurements were then taken (in mm) with a calibrated calliper. These measurements were selected in order to quantify the relationship of the CPN and its branches to fixed and easily identifiable bony landmarks around the proximal knee.

- [M1] From the apex of the styloid process of the fibular head to where the CPN reaches the fibular neck ([2] to [5]).
- [M2] From the apex of the styloid process of the fibular head to the most proximal point of the CPN or recurrent articular nerve, in the midline of the fibular head ([2] to [6]).
- [M3] From the apex of the radial styloid to the broadest point of the fibular head to the anterior margin of the CPN as it passes posterior to the broadest point of the fibular head ([2] to [4]).
- [M4] From the tibial tuberosity to the apex of the styloid process of the fibular head ([1] to [2]).
- [M5] From the tibial tuberosity to where the CPN reaches the fibular neck ([1] to [5]).
- [M6] From the tibial tuberosity to the most proximal point of the CPN or the recurrent articular nerve at the fibular neck, in the middle of the fibular head ([1] to [6]).
- [M7] From the tibial tuberosity to the anterior margin of the CPN as it passes posterior to the broadest point of the fibular head ([1] to [4]).

- [M8] The diameter of the fibular head at the broadest point from anterior to the posterior aspect ([3] to [4]).

For the second part of the study, the fibula tunnel was drilled in 21, randomly selected knees with a 5 mm non-cannulated drill according to the suggestions by Niki et al. [16]. The 21 knees were selected from the 101 previously dissected ones; therefore, the position of the CPN and its branches were exposed. The starting point was at the distal anterolateral aspect of the fibula head which corresponds to the anatomical insertion of the LCL, exiting at the proximal postero-medial aspect of the fibula head, which corresponds to the popliteofibular ligament (Fig. 3). With tunnel drilling, the researcher was instructed to use his usual surgical technique but adhere to the technique described by Niki et al. [16]. The surgeon who drilled these tunnels was a fellowship trained and highly experienced physician who performed over 100 PLC reconstructions combined with either anterior cruciate or multi-ligament reconstructions. It is realized that this approach may have introduced bias as the landmarks for tunnel placement were not determined by exact measures. However, this protocol was selected on intention to simulate a ‘real-case’ scenario in the operating rooms. The main outcome measure was binary [yes (0) or no (1)]: Did the drill bit or tunnel intersect with the CPN or any one of its branches along the anterior fibular neck. In addition, two independent examiners investigated the relationship of the recurrent articular nerve at the tunnel entry and recorded (observation 1) whether the nerve intersected and/or was damaged by the drilling (D), or whether the nerve passed either superior (S), inferior (I), medial (M), lateral (L) or posterior (P). Similar, the relationship of the CPN at the tunnel exit (observation 2) was investigated using the same qualitative assessment.

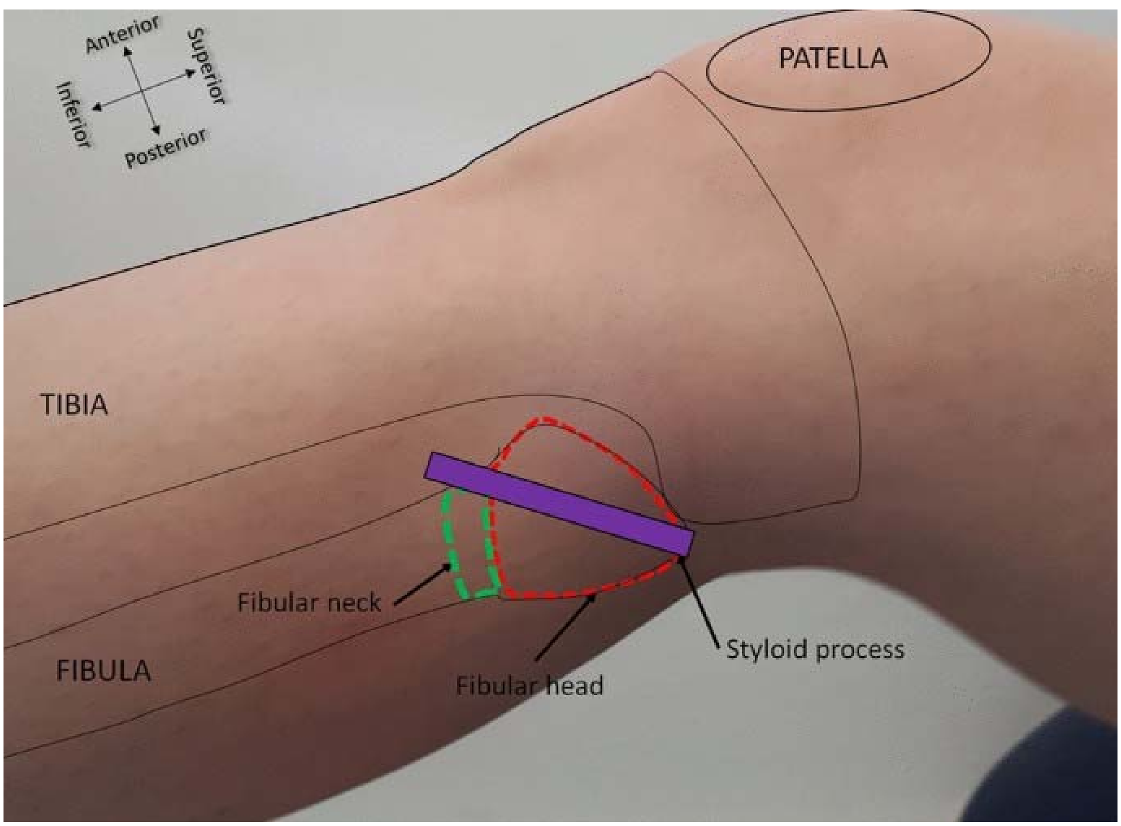

Fig. 3. Fibula tunnel drilling: the starting point was at the distal anterolateral aspect of the fibula head which corresponds to the anatomical insertion of the LCL exiting at the proximal postero-medial aspect of the fibula head, which corresponds to the popliteofibular ligament

Statistical analysis

Descriptive statistics were used for the distance measurements and the relationships between the CPN, its branches and the bony landmarks. The mean length, standard deviations and 95% confidence intervals were calculated and Fisher's exact test of independence was used to determine significant differences between sex and laterality. Tunnel intersection was analysed in a binary, yes/no fashion, and was described in frequencies and percentages. Intra- and inter-rater reliability (ICC) was established by repeating the measures on two consecutive days in twenty specimens. The algorithm of Landis and Koch was used to assess the rate of agreement [24]. Values above 0.80 represented excellent agreement, values between 0.62–0.79 were considered good agreement, values between 0.41–0.61 indicated moderate agreement, and values below 0.4 suggested fair to poor agreement [24]. To establish the number of specimens required for tunnel drilling, the concept of random chance sampling which is based on probability sampling by van Rijnsoever was utilized [25]. Two observing codes (nerve damage at the entry and exit) suggest that a sample requires a minimum of 10 samples [25]. All analyses were conducted using STATA SE (version 12.0; StataCorp, College Station, Texas, USA) for Windows.

Results

Of the 116 knees, 15 specimens were excluded (nerve damage, $n = 12$; knee disarticulation, $n = 1$; total knee replacement; $n = 2$] leaving 101 knees for assessment. There were 52 male and 49 female knees. There were 49 right and 52 left knees. The [M1] to [M8] measures are summarized in Table 1. No significant differences between males and females for M1 ($p = 0.23$), M2 ($p = 0.19$), M3 ($p = 0.12$), M4 ($p = 0.06$), M5 ($p = 0.24$) and M8 ($p = 0.42$) were noted; however, differences were observed for M6 ($p = 0.02$) and M7 ($p = 0.002$). The distance between the tibial tuberosity and the most proximal point of the CPN, or recurrent articular nerve at the fibular neck, in the middle of the fibular head (M6) was 3.9 mm longer in males, and the distance between the tibial tuberosity and the anterior margin of the CPN as it passes posterior to the broadest point of the fibular head was also 3.9 mm longer in males. There were no significant differences between right and left knees for all measurements: M1 ($p = 0.91$), M2 ($p = 0.62$), M3 ($p = 0.87$), M4 ($p = 0.95$), M5 ($p = 0.99$), M6 ($p = 0.89$), M7 ($p = 0.49$) and M8 ($p = 0.82$).

Table 1. Summary of the anatomic measures

	Mean	SD	Range	95% CI
Total				
M1	31.4	8.9	16.9–57.5	29.8–33.0
M2	37.0	6.7	23.3–53.9	35.4–37.7
M3	21.7	12.6	8.7–56.6	19.4–24.0
M4	29.4	8.6	21.2–55.4	27.9–31.0
M5	63.5	14.0	29.9–85	61.0–66.0
M6	59.7	9.0	35.5–75.0	58.1–61.3
M7	54.4	5.9	39.6–68.9	53.3–55.5
M8	61.0	17.2	20–84.4	58.0–64.1
Male				
M1	32.4	10.1	16.9–57.5	29.8–35.1
M2	37.4	7.2	23.3–53.9	35.8–39.2
M3	23.5	13.7	8.7–56.6	20.0–27.1
M4	31.0	9.5	21.2–55.4	28.5–33.5
M5	65.1	15.3	29.9–85	61.1–69.1
M6	61.7	9.2	41.4–75.0	59.3–64.1
M7	56.4	5.4	45.3–68.9	55.0–57.9
M8	62.3	19.7	23.8–84.4	57.5–67.2
Female				
M1	30.5	7.6	21.3–52.4	27.7–31.1
M2	35.9	5.3	27.3–49.3	34.0–36.6
M3	20.0	11.4	10.9–52.4	15.7–20.6
M4	28.0	7.5	22.4–51.4	25.2–28.4
M5	62.1	12.7	30.0–75.7	61.2–66.7
M6	57.9	8.4	35.5–69.9	57.1–61.0
M7	52.5	5.8	39.6–63.5	51.6–54.5
M8	59.8	15.7	20–74.7	59.0–65.7
Right				
M1	31.3	8.9	19.5–57.5	29.0–33.7
M2	36.3	6.5	23.3–53.9	34.6–38.0
M3	21.5	12.8	8.7–56.6	18.1–24.8
M4	29.4	8.9	21.2–55.4	27.1–31.7
M5	63.5	13.9	29.9–80.2	59.9–67.1
M6	59.6	8.8	38.6–74.7	57.3–61.9
M7	54.0	5.8	39.6–68.9	52.5–55.5
M8	60.7	16.9	20.0–80.5	56.3–65.1
Left				
M1	31.5	9.0	16.9–55.1	28.2–32.3
M2	36.9	6.2	25.5–53.2	34.6–37.5
M3	21.9	12.6	11.4–53.5	17.2–22.8
M4	29.5	8.4	22.4–54.6	26.4–30.0
M5	63.5	14.3	30.4–85	61.9–68.7
M6	59.8	9.2	35.5–75	58.4–63.0
M7	54.7	6.1	41.5–68.2	53.3–56.6
M8	61.4	17.6	20.8–84.4	59.5–67.8

[M1] from the apex of the styloid process of the fibular head to where the CPN reaches the fibular neck; [M2] from the apex of the styloid process of the fibular head to the most proximal point of the CPN or CFN branch at the fibular neck, in the midline of the fibular head; [M3] from the apex of the radial styloid to the broadest point of the fibular head to the anterior margin of the CPN as it passes posterior to the broadest point of the fibular head; [M4] from the tibial tuberosity to the apex of the styloid process of the fibular head; [M5] from the tibial tuberosity to where the CPN reaches the fibular neck; [M6] from the tibial tuberosity to the most proximal point of the CPN or first CPN branch at the fibular neck, in the middle of the fibular head; [M7] from the tibial tuberosity to the anterior margin of the CPN as it passes posterior to the broadest point of the fibular head; [M8] the diameter of the fibular head at the broadest point from anterior to the posterior aspect. All measures are reported in millimetres

Intra-rater reliability ranged from 0.76 to 0.94, and inter-rater reliability ranged from 0.68 to 0.91. In general, it was observed that the measures from the tibial tuberosity (M4-M7) had lower agreement values and ranged from 0.68 to 0.82 for both intra- and inter-rater reliability. According to Landis, the agreement can be considered good to excellent [24].

Observation 1 (Intersection or damage of the first branch of the CPN at the tunnel entry)

In 7 of the 21 knees (33%), the CPN was damaged at the tunnel entry, while in 1 knee, the drilling nearly damaged the recurrent articular nerve (Fig. 4). When including this knee, the rate of damage increased to 38% ($n = 8/21$). In all of these cases, it was the recurrent articular nerve that crossed the neck and entered the anterior tibial compartment (Fig. 5). In the remaining 14 knees, the first branch of the nerve passed inferior to the tunnel entry.

Fig. 4. Cadaver photograph of a right knee clearly showing the anterior tibial recurrent nerve (black arrow) which is the first branch of the CPN and its close association with the head of the fibula

Fig. 5. Cadaver photograph of a left knee clearly showing the ATRN crossing the fibula neck and entering the anterior tibial compartment. When drilling the tunnel entry, this nerve is clearly in danger [black arrow]

Observation 2 (Intersection or damage of the CPN at the tunnel exit)

In 5 of the 21 knees (24%), the CPN was damaged at the tunnel exit (Fig. 6). In all 5 knees, the CPN was located directly posterior to the tunnel exit. In 2 knees, the CPN was nearly damaged by drilling. When including these 2 knees, the rate of damage increased to 33% ($n = 7/21$). In all 7 cases, the nerve was located posterior to the tunnel exit. In one knee, the nerve was damaged at both the tunnel entry and exit. The first branch was located at the inferior aspect of the tunnel entry and posterior to the tunnel exit. In the remaining 14 knees, the CPN was located lateral to the tunnel exit (Fig. 7).

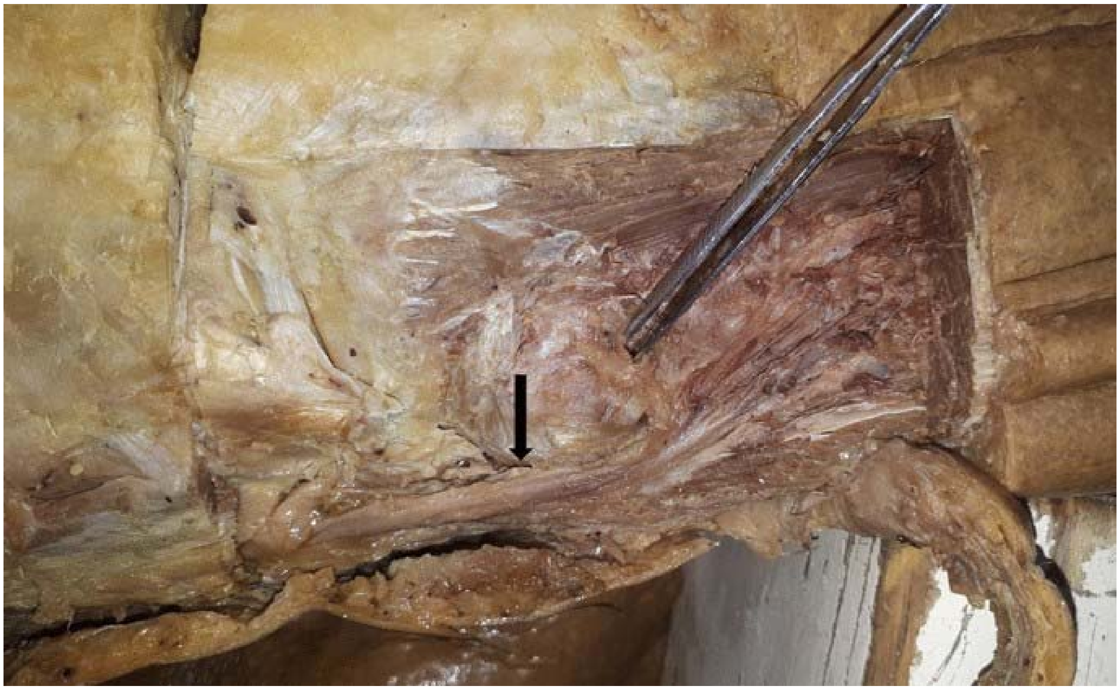

Fig. 6. Cadaver photograph of a right knee clearly showing the drilled tunnel with a forceps placed into the tunnel. The trajectory of the tunnel damaged the CPN at the tunnel exit [black arrow]. The tunnel exit projected directly into the nerve

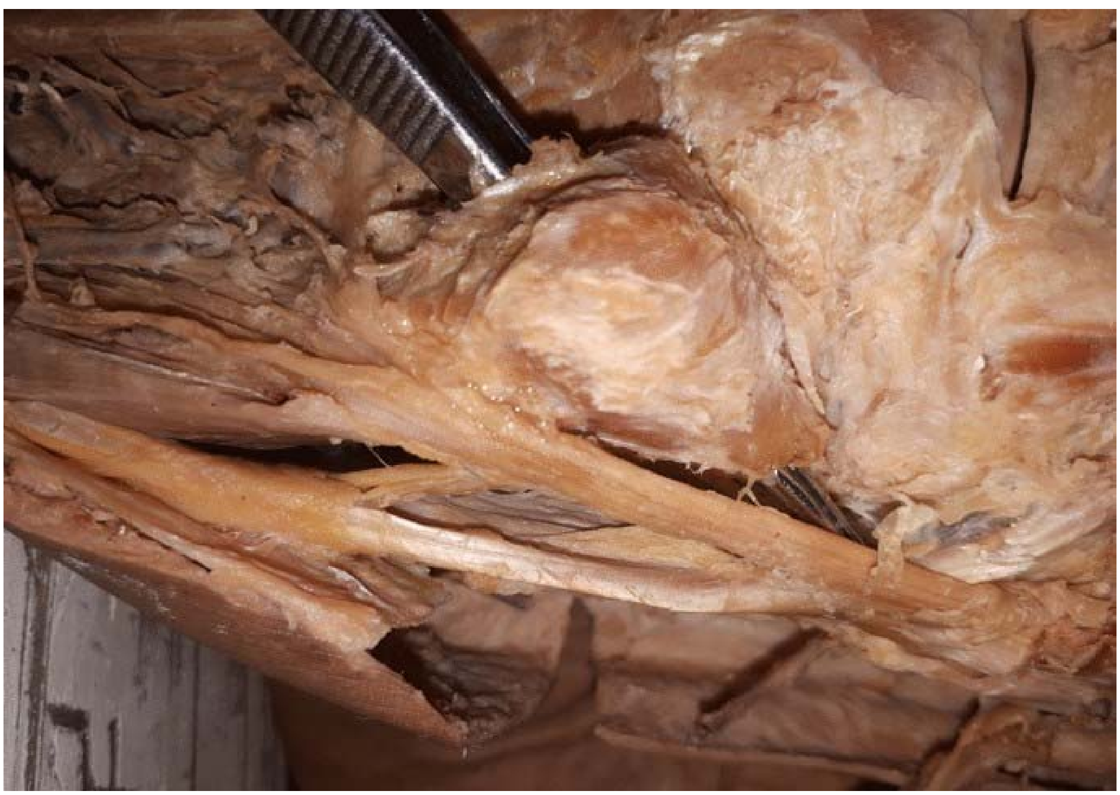

Fig. 7. Cadaver photograph of a left knee clearly showing the drilled tunnel with a forceps placed into the tunnel. The trajectory of the tunnel was safe with no injury to the ATRN which was inferior and posterior to the tunnel entry and no injury to the CPN which was located posterior and lateral to the tunnel exit

Discussion

The most important finding of this anatomical study that relates to the clinical relevance of the variation of the CPN and its branches was the high rate of injury of the CPN when drilling fibula tunnels for posterolateral corner reconstructions. In this sample of 21 knees, the CPN was damaged in 33% at the tunnel entry and in 24% at the tunnel exit. When combining injury for both the tunnel entry and exit, the rate of CPN injury was 57%.

This study quantified the relationship of the CPN and its branches to prominent and easily identifiable bony landmarks to assist in finding the position of nerve for surgery. Due to the lower reliability scores relating to the tibial tuberosity measurements, it can be suggested that this bony landmark may not be adequate in determining the location of the CPN and its branches. Due to the somewhat irregular topography of the tibial tuberosity, it creates difficulty in determining the exact point of the apex and appears to fall more into the floating landmark territory, which has been found to be less accurate than fixed and well-defined bony landmarks, such as the styloid process of the fibular head. The distance from the apex of the styloid process of the fibular head to the anterior margin of the CPN as it passes posterior to the broadest point of the fibular head (M3) was measured to range from 10.9–52.4 mm in females and between 8.7–56.6 mm in males. While these distances have a large variance, the 95% confidence intervals suggest a rather narrow interval and ranges from 16–21 mm in females and 20–27 mm in males. These measures allow the identification of the posterior position of the CPN in a narrow interval of 10 mm with a 95% probability. Coincidently, the distance also correlated with the most posterior and broadest point of the fibula head, which is easily palpated and located in a minimally invasive approach. Once the nerve has been identified at this point it can then be followed back along its course (retrograde fashion) to the planned tunnel exit and protected during tunnel drilling. Similar, the distance from the apex of the styloid process of the fibular head to the most proximal point of the CPN or the recurrent articular nerve at the fibular neck had a rather large variance from 23–54 mm in the males and 27–49 mm in the females, but again, the 95% confidence intervals ranged from 36–39 mm in the male and 34–37 mm in the female group. These narrow intervals will allow easier identification and avoid nerve injury for the tunnel entry. We believe that identification of these landmarks and measurements will allow a minimally invasive approach to the fibula when performing PLC reconstructions. Wechter et al. have described a 50-degree external rotated tunnel in relation to the tibial tuberosity and a 60-degree angle with the tunnel entry located at insertion of the lateral collateral ligament on the anterolateral aspect of the fibula head [26]. The authors have not specifically described anatomic relationships, but measured the distance from tunnel exit to the peroneal nerve [26]. The mean difference was 11 mm demonstrating the close distance to the nerve confirming again the vulnerability of the CPN with guide pin placement and tunnel drilling.

High-grade posterolateral corner (PLC) injuries warrant surgical treatment [5, 13, 27]. Current surgical techniques focus on the reconstruction of the fibular tunnel, the fibular collateral ligament and popliteofibular ligament and the popliteal tendon [28]. Multiple surgical techniques have been described; however, they all require the creation of a fibula tunnel [6, 12, 28, 29]. The fibula tunnel is created by drilling in an anterolateral to posteromedial direction at the level of the maximal fibula head diameter [7, 16]. The CPN is located subfascially and follows the posterior and medial border of the biceps femoris tendon crossing the fibula head [22, 30]. The direction of the tunnel and variable location of the nerve clearly puts the CPN at risk during the drilling. Minimally invasive techniques, with or without arthroscopy assistance, have been recently described as safe and efficient but require substantial experience [8, 27, 31]. However, blind drilling potentially increases the risk of CPN injury. When using a standard approach for tunnel drilling [16], we have demonstrated an unacceptable high rate of CPN injury, which is possibly avoidable with open approaches and visualization and protection of the nerve. In our series, injury occurred when the nerve was directly posterior to the tunnel exit. In the remaining cases, the nerve was located lateral to the tunnel exit and it could be argued that the more lateral location is more protective. These facts provide a compelling and strong argument to visualize and protect the nerve during surgery. This could either be achieved by a traditional open approach or by mini-invasive techniques using jigs to protect the nerve at the posterior tunnel exit. However, this does not address the nerve injuries at the tunnel entry. The results of this study strongly discourage a percutaneous approach.

Surprisingly, there are very few studies reporting complications following surgical reconstruction of the PLC with a fibula-based approach. Vega-Espana et al. used an arthroscopic assisted minimally invasive approach in seven patients and did not observe any nerve injuries [31]. Zantop and Petersen reported the results of PLC reconstruction using the modified Larson technique with a minimally invasive approach and did not report any complications [8]. The results of peroneal nerve injuries associated with PLC injuries are not well documented and range from 14–40% [32]. Recently, the rate of injury was reported to be 26% with an overall recovery of 50% [1]. Avoidance of iatrogenic injury thus seems crucial to avoid poor outcomes.

Limitations

This study has several limitations. Embalmed human cadavers could result in changes of anatomic morphology and increasing difficulty with dissection [33]. However, Kennel et al. were able to demonstrate that embalming was unlikely to influence either dissection, tissue handling or anatomy [34]. Due the position of the nerve against the neck of the fibula, there is minimally effect or distortion caused by the embalming process [33, 34]. If the nerve were situated within muscle or measured against soft tissue structures, there would be the potential of systematic error. As always with relatively small sample sizes, the findings of this study may not be representative of the general population; however, the narrow confidence intervals suggest the results have internal validity.

Conclusion

The results of this study clearly demonstrate the close anatomical relationship of the CPN and the recurrent articular nerve with the proximal knee, particularly with prominent bony landmarks of the fibular head. In majority of the sample, the recurrent articular nerve branched from the lateral side of the fibular neck and ran a very proximal course around the neck medially. The CPN was also observed to lie very posterior to head of the fibula placing it is potential danger with drilling of a fibula tunnel during PLC reconstructions. The results suggest that the CPN is at increased risk when drilling the fibula tunnel when performing fibula-based posterolateral corner reconstructions. The observed injury rate was 57% with a 33% incidence of injury to the recurrent articular nerve at the tunnel entry and 24% to the CPN at the tunnel exit.

Ethics declarations

Conflict of interest

The authors declare no conflict of interest with the presented body of research.

Ethical approval

This project was approved by the University of Pretoria Institutional Review Board and Human Research Ethics Committee.

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