A preliminary study in an innovative ultrasound-assisted patient-tailored lumbar plexus block performed with alternative anatomical landmarks

E. Pisello[1,2], L. Brugiaferri[1], M. Ciuffreda[2], L. Angelelli[2], J. Silvestri[1], S. Sorrenti[1], C. Chinigioli[1], D. Aucone[3], C. Piangatelli[2], D. Galante[4].

[1]Department of Anesthesia, Resuscitation, Intensive Care and Pain Management, Università Politecnica delle Marche, Ancona, Italy.
[2]Department of Anesthesia, Resuscitation, Intensive Care and Pain Management, AST Ancona, Fabriano, Italy.
[2*]Chief, Department of Anesthesia, Resuscitation, Intensive Care and Pain Management, AST Ancona, Fabriano, Italy.
[3]Chief, Department of Orthopaedics, AST Ancona, Fabriano, Italy.
[4]Chief, Department of Anesthesia, Resuscitation, Intensive Care and Pain Management, Cerignola, Italy

Corresponding author: M. Ciuffreda, Medical executive in Anaesthesia, Resuscitation, Intensive Care and Pain Management Unit, AST Ancona, Fabriano, Italy. Email: ciuffredamat@libero.it

Key points

1. Lumbar plexus block (LPB) is an advanced regional anesthesia technique practiced by relatively few experienced regional anesthesiologists, as it represents the most proximal approach to the lumbar plexus, providing the most reliable block of its major branches (femoral, obturator, and lateral femoral cutaneous nerves); LPB is traditionally performed using standard measured surface anatomical landmarks to identify the site for needle insertion.
2. Challenges in performing LPB are mainly related to safety because of depth of target structures and the high risk of accidental punctures: small errors in landmark estimation or angle miscalculations during needle advancement can result in wrong and dangerous needle placements.
3. Although modern ultrasound guidance may allow visualization of the lumbar plexus, ultrasound-guided techniques still require additional expertise while being operator-dependent and not suitable in obese or unfavorable patients, which represents the most frequent "real world" scenario.
4. This preliminary study describes our innovative and alternative ultrasound-assisted patient-tailored operating protocol to perform a safer and consistent lumbar plexus block involving a quick and easy sonographic assistance together with patient-tailored alternative anatomical landmarks derived from Traditional Chinese Medicine.

Abstract

Introduction

Lumbar plexus block (LPB) is an advanced regional anesthesia technique practiced by relatively few experienced regional anesthesiologists, as it represents the most proximal approach to the lumbar plexus, providing the most reliable block of its major branches (femoral, obturator, and lateral femoral cutaneous nerves). Difficulties are linked to the depth of structures and the high risk of accidental punctures, lowering its safety expecially in obese or unfavorable patients. Complications arising from an incorrect block are principally attributed to inadvertent epidural and intrathecal spread or administration of local anesthetics,

followed by direct trauma to nerves, intra-neural injection, damage to abdominal viscera, retroperitoneal haematomas, intravascular injection and local anesthetics toxicity. Ultrasound-guided LBP techniques (i.e., Shamrock and Trident techniques) still require additional expertise while being operator-dependent and not suitable in every patient, the most frequent "real world" scenario. Given its usefulness in lower limbs surgery, we developed a new ultrasound-assisted patient-tailored Traditional Chinese Medicine based operating protocol to increase lumbar plexus block's safety and constancy of performance.

Objectives

Main objective of this preliminary prospective, non-interventional, non-pharmacological, descriptive observational study is to evaluate safety and success rate of our ultrasound-assisted patient-tailored Traditional Chinese Medicine based lumbar plexus block operating protocol.

Material and Methods

47 patients aged from 16 to 86 years old undergoing a scheduled or emergency regimen orthopedic lower limb surgery with lumbar plexus block performed before general or subarachnoid anesthesia. Needle puncture was carried out on L5 transverse process (sonographically identified) with a lateral drift of 1.5 CUN (the distance between the 2nd and 3rd paired fingers measured at the level of the distal interphalangeal joint of patient's non dominant hand, converted in centimeters) from the interspinous line (acupuncture bladder meridian point 26); after bone contact (depth from skin sonographically estimated), needle is orientated to pass L5 transverse process (cranially or laterally) advancing 2-3 cm deeper until ENS confirmation. Preoperative data such as gender, age, weight, height, BMI, type of lower limb surgery, conversion of 1,5 CUN measurement in centimeters and sonographic confirmation of L5 transverse process position estimated by Chayen's approach was collected for each patient. Data on possible needle puncture associated complications was gathered

Results

Our approach showed an high success rate of 91,49% regardless of patients' age (55,32% of cases were 70 y.o. or older, age top value 84 y.o.) and BMI (27,66% of patients were class 1 obese or higher, BMI top value 39,4) both usually responsible for significant anatomical alterations compromising locoregional anesthesia. In 87,23% of cases there was no correspondence between Chayen's approach estimated L5 transverse process position and its sonographic confirmation, underlining the danger of a "blind block technique".

No needle puncture associated complications as intrathecal injection (liquor aspiration from needle and/or subarachnoid-like sensory effect), renal injury (hematuria and/or urine aspiration from needle), LAST, vascular injuries (hematomas or unexpected bleeding from puncture site) or nerve injuries (post-operative delayed anesthesia, paresthesia and/or motor deficiency) were found, confirming the efficacy of our "safety first" approach.

Conclusions

Our LBP approach, based on a quick and easy sonographic assistance (L5 transverse process and it's depth from skin identification), a patient-tailored Traditional Chinese Medicine based puncture site (1,5 CUN, converted in centimeters, lateral to interspinous line), needle bone contact, ENS confirmation, negative aspiration from needle before injection, positive Raj Test (defined by the loss of a motor response to ENS stimulation after 1 ml initial injection of local anesthetic) and no evoked pain during local anesthetic injection, increased lumbar plexus block safety and constancy of performance even in obese patients or those with unfavorable anatomy, unlike known ultrasound-guided lumbar plexus blocks (i.e. Shamrock and Trident techniques) where deep and complex target structures are poorly visible in a "real world "scenario, increasing the risk of complications and failures.

Keyword

Lumbar plexus block; Ultrasound assisted lumbar plexus block; Traditional Chinese Medicine; CUN; bladder meridian point 26 acupuncture; alternative anatomical landmarks on lumbar plexus block; locoregional anesthesia; lower limb surgery block; lumbar plexus block safety.

Introduction

Lumbar plexus consists of ventral roots of the first three lumbar nerves and the greater part of the ventral root of the fourth nerve. The first lumbar nerve, frequently supplemented by the twelfth thoracic nerve, splits into an upper branch that divides into iliohypogastric and ilioinguinal nerves; the lower branch unites with a branch coming from the second lumbar, forming the genitofemoral nerve. From the remains of the second lumbar nerve, the third and fourth nerves divide into ventral and dorsal divisions. Anterior divisions unite to form obturator nerves, while the dorsal ones unite to form the lateral femoral cutaneous nerve and the larger femoral nerve (*Figure 1*).

The main terminal branches of the lumbar plexus are considered below:

- *iliohypogastric nerve*, which divides into an anterior and a lateral cutaneous branch just above the iliac crest. The anterior cutaneous branch innervates the skin over the anterior aspect of the abdomen above the pubis, while the lateral branch supplies skin innervation over the posterolateral aspect of the gluteal region;
- *ilioinguinal nerve*, which emerges caudal to the iliohypogastric nerve at the lateral border of the psoas muscle. It provides sensory innervation to the superomedial thigh and genital region;
- *genitofemoral nerve*, which divides into genital and femoral branches. The genital branch supplies skin innervation of scrotum in men and mons pubis'skin together with labium majus in women. The femoral branch lies lateral to the femoral artery in the femoral sheath and supplies sensory skin innervations over the upper part of the femoral triangle;
- *femoral nerve*, which is the largest terminal branch of the lumbar plexus. It emerges from the lower part of the psoas major muscle and iliacus muscle deep to the iliacus fascia. It innervates the pectineus muscle before entering the thigh by passing underneath the inguinal ligament to lie lateral to the femoral artery. It provides sensory innervation to the anterior thigh and the medial lower leg, while motor supply to the quadriceps muscle;

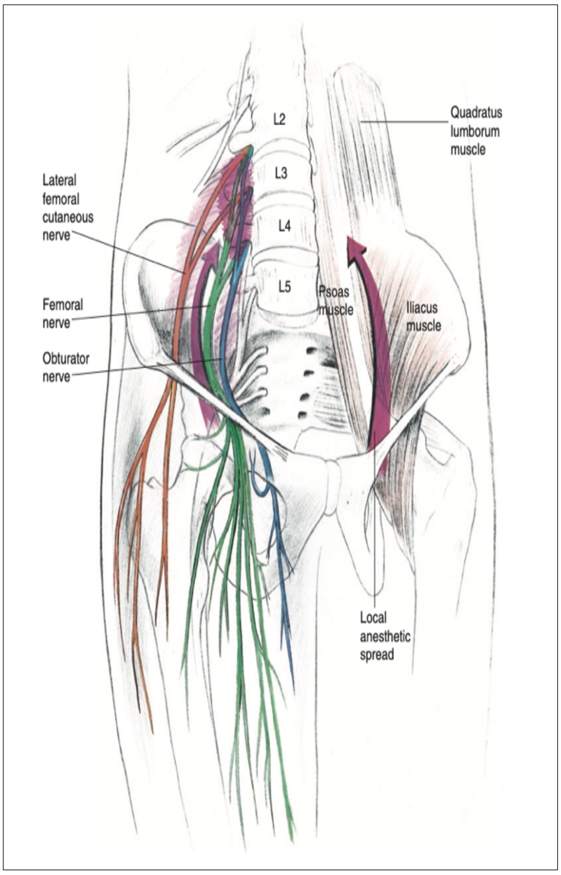

Figure 1. Lumbar plexus anatomy.

- *obturator nerve*, which descends through the psoas major muscle emerging near the pelvic brim and entering the thigh by passing through the obturator foramen, where it divides into the anterior and posterior branches. Motor supply is to the obturator externus and adductor muscles, with sensory innervations supplied to the hip and knee joints. Sensory innervation, and therefore block, can be variable, with adductor muscle weakness being the most reliable sign of obturator nerve block;

- *lateral cutaneous nerve of the thigh*, which arises from the lateral part of the psoas muscle, crossing the iliacus and running towards the anterior superior iliac spines. It passes under the inguinal ligament 1 cm medial to the anterior superior iliac spines to supply sensory innervation to the anterior and lateral aspects of the thigh.

Lumbar plexus and its branches are located within the psoas major muscle, facing the anterior aspect of lumbar vertebrae transverse processes. The anterior two-thirds of psoas muscle originate from the anterolateral aspect of vertebral bodies, while the posterior one-third of the muscle originates from the anterior aspect of transverse processes, creating a fascial plane between both muscle compartments. Erector spinae muscle covers the lumbar spine posteriorly and medially, while quadratus lumborum muscle covers it laterally.

Lumbar plexus block (LPB) is an advanced regional anesthesia technique practiced by relatively few experienced regional anesthesiologists, as it represents the most proximal approach to the lumbar plexus, providing the most reliable block of its major branches (femoral, obturator, and lateral femoral cutaneous nerves, as shown in *Figure 2*). LPB is ideal for knee, hip and above-knee surgeries; when combined with a sciatic nerve block, it provides a complete unilateral lower limb anesthesia suitable for lower extremity surgeries; continuous infusion trough perineural catheter can be used for prolonged anesthesia and analgesia.

The first description of LPB dates back nearly 50 years, when Winnie et al. proposed that a large volume of local anesthetic injected in the femoral nerve sheath could spread proximally to produce blockade of the obturator, lateral femoral cutaneous, femoral nerve and presumably other nerves of the lumbar plexus, referred as a “3 in 1 technique”. In 1976 Chayen et al. described a “posterior lumbar plexus block” or “psoas compartment block,” which proved to be a more reliable and complete block of the lumbar plexus performed with a single injection. Touray et al. were among those who demonstrated that whereas both approaches effectively block femoral and lateral femoral cutaneous nerves, only the posterior lumbar plexus approach is also able to block the obturator nerve. Original techniques relied on the “loss of resistance at needle” target finding, transitioning over the years to a nerve stimulator technique based on motor stimulation of the femoral nerve with quadriceps twitch.

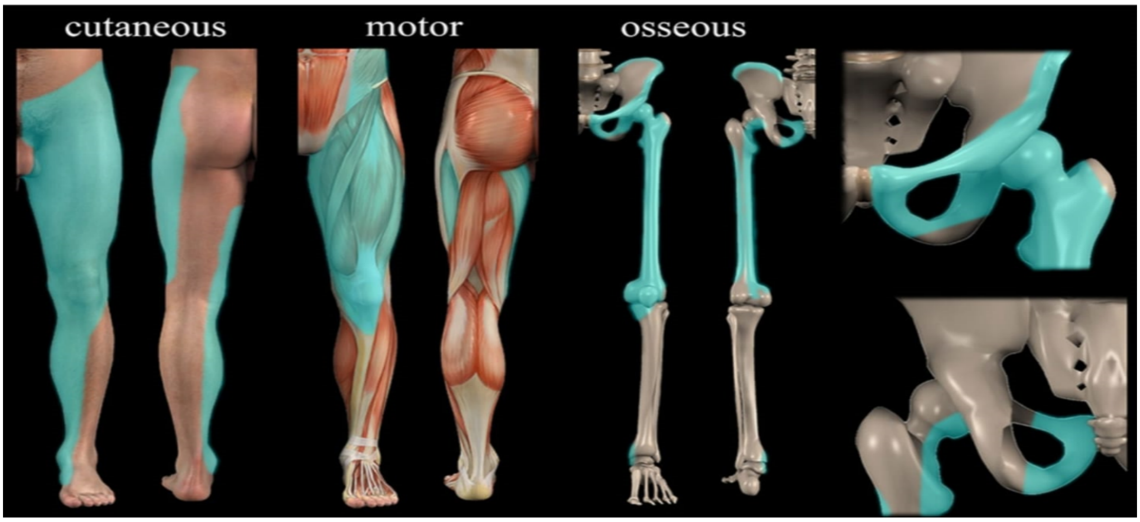

Figure 2. Cutaneous, motor and osseous coverage provided by LPB.

Traditionally, LPB is performed using standard measured surface anatomical landmarks (Tuffier line based "blind approaches") to identify the site for needle insertion followed by eliciting quadriceps muscle contraction in response to electrical neural stimulation (ENS). Four blind approaches have been described over the years as Chayen's approach, Winnie's approach, Dekrey's approach and Capdevila's approach. In Chayen's approach, the most used in our regional hospital network, L4 spinous process is identified from the intercristal or Tuffier line (*Figure 3*), with needle entry point located 3 cm caudally and 5 cm laterally from it; once granted needle contact to L5 transverse process (target of this approach), needle is then re-angled slightly cranially to pass between L4 and L5 transverse processes advancing 1-2 cm further. Endpoint is twitching/contraction of the ipsilateral quadriceps. Quadriceps contraction which produces patella twitching should be sought with an initial current of 1-2 mA, and once elicited, the current should be reduced until contraction is still present at < 0.5mA. If muscle contraction is lost before 0.5 mA, then gentle needle repositioning is required. Contraction should stop below a current of 0.2mA, otherwise intraneural needle position should be suspected.

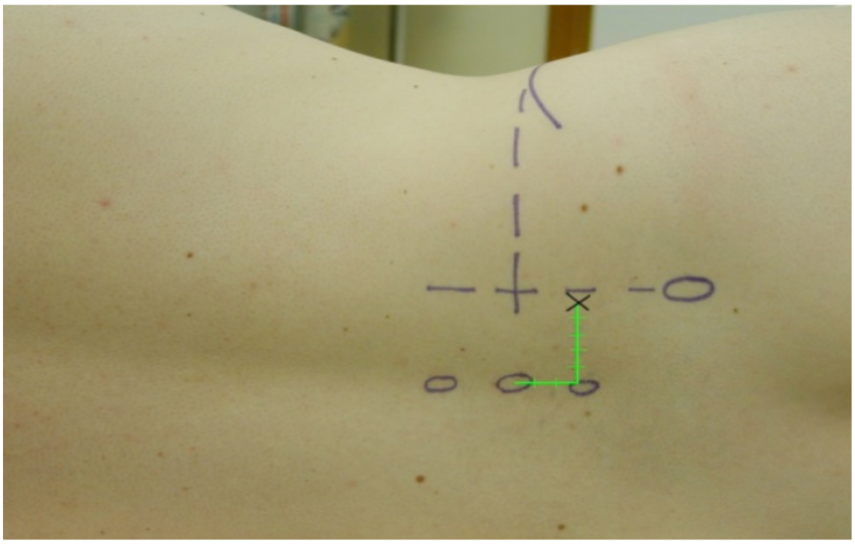

Figure 3. Chayen's approach.

LBP requires a large volume of local anesthetic to obtain a reliable block (30 to 40 ml are recommended); total local anesthetic dose should be considered in the context of patient's size, anesthetic type and coadministration of different local anesthetics and should not exceed maximum recommended doses (due to psoas muscle vascularity, it would be wise to always use lower doses than maximum).

Challenges in performing LPB are mainly related to safety because of depth of target structures and the high risk of accidental punctures: small errors in landmark estimation or angle miscalculations during needle advancement can result in wrong and dangerous needle placements. Several studies have described the distance from the skin to the lumbar plexus, which ranges from 9 to 10 cm while being slightly deeper in males than females. The distance between the anterior border of the transverse process to lumbar plexus ranges between 1,5 to 2 cm, with a median value of 1,8 cm in both sexes. Caution is urged regarding depth of needle insertion as an insertion more than 2-3 cm beyond the transverse process may increase the risk of retroperitoneal or even intraperitoneal injury. Similarly, a needle insertion deeper than 10 to 12 cm may increase the risk of injury.

LPB complications (calculated as 80:10000 versus an overall incidence of 5:10000 for regional anaesthesia) include intrathecal spread or injection, damages to abdominal viscera (renal puncture), vascular punctures and retroperitoneal or psoas haematomas, local anesthetic systemic toxicity, and peripheral nerve injury.

- Intrathecal injection, local anesthetic spread to the epidural space and spinal anesthesia as complications of lumbar plexus block are rare but favored by a more medial needle insertion and a more cephalic approach (L3); prevalence is unknown as most of the information comes from case reports (Auroy et al. cited 5 cases of major complications after the LP block from a sample of 394 patients).

- Renal injury such as a subcapsular hematoma rare and associated with the use of a more cephalad (L3) injection site, such as at the level of L3.
- Local anesthetic systemic toxicity (LAST) is a potential complication of any nerve block resulting of intravascular injection or excessive dose of local anesthetic; treatment should include immediate administration of intravenous intralipid and supportive measures.
- Retroperitoneal or psoas hematoma or other vascular injury are rare but major complications of LPB. The risk of bleeding in a non-compressible space such as the psoas compartment is uncertain but is of greater concern when the bleeding site cannot be compressed and observed, and that's why patients on anticoagulation therapy or coagulopathy may not be proper candidates for this block. Deep blocks as this should follow ESAIC/ESRA 2022 guidelines for deep blocks and neuraxial blocks in patients receiving anticoagulation or anti-aggregation therapy.
- The risk of a peripheral nerve injury is one of the most common questions patients ask their physicians while it is also rare (rate of 0.1% and lower). A muscle twitch response during neurostimulation at a current of less than 0.2 mA is correlated with a high rate of nerve injury.

Ultrasound-guided approaches to LPB have been proposed in literature during years. Although modern ultrasound guidance may allow visualization of the lumbar plexus, ultrasound-guided techniques (i.e., Shamrock and Trident techniques) still require additional expertise while being operator-dependent and not suitable in obese or unfavorable patients, which represents the most frequent "real world" scenario. Thus far, evidence is lacking to support the superiority of any one of the ultrasound-guided techniques. We also must not forget that lumbar plexus lies at depth of about 70-85mm from skin while being covered by transverse processes and their acoustic shadow, below which valid images are usually hardly achieved.

Absolute contraindications on LPB include patient refusal, local anesthetics allergy, local infection at puncture site (or within psoas muscle), INR > 1,5 or < 12 hours post LWMH (many practitioners consider a posterior approach to lumbar plexus comparable to central neuraxial blockade), meanwhile relative contraindications include systemic sepsis (especially for catheter placement), poor cardiac function or limited cardiac output (because of the risk of epidural or subarachnoid spreading from posterior approach puncture).

Objectives

Given lumbar plexus block usefulness in lower limbs surgery, we struggled to develop an alternative operating protocol to increase its safety and constancy of performance. Main objective of this preliminary study is thus to evaluate safety and success rate of our ultrasound-assisted patient-tailored Traditional Chinese Medicine based lumbar plexus block operating protocol.

Material and methods

For the purpose of this preliminary prospective, non-interventional, non-pharmacological, descriptive observational study, 47 patients aged from 16 to 86 years old were recruited at the E. Profili Hospital in Fabriano - Anesthesia, Intensive Care and Pain Therapy unit. Such patients underwent a scheduled or emergency regimen orthopedic lower limb surgery; a single shot LBP with 30ml Ropivacaine 2mg/kg with optional perineural catheter placement was performed before general or subarachnoid anesthesia.

Preoperative data such as gender, age, weight, height, BMI, type of lower limb surgery, conversion of 1,5 CUN measurement in centimeters (see later) and sonographic confirmation of L5 transverse process position estimated by Chayen's approach (the most used "blind LPB approach" in our regional hospital network) was collected for each patient. A successfully and safely executed lumbar plexus block was defined by a patellar twitch evoked under ENS stimulation between 0,2 and 0,5mA, negative blood, liquor or urine aspiration from needle before injection, positive Raj Test (defined by the loss of a motor response to ENS stimulation after 1 ml initial injection of local anesthetic) and no evoked pain during local anesthetic injection. Data on possible needle puncture associated complications as intrathecal injection (liquor aspiration from needle and/or subarachnoid-like sensory effect), renal injury (hematuria and/or urine aspiration from needle), LAST, vascular injuries (hematomas or unexpected bleeding from puncture site) and nerve injury (post-operative delayed anesthesia, paresthesia and/or motor deficiency) was also gathered.

Our innovative ultrasound-assisted patient-tailored Traditional Chinese Medicine based lumbar plexus block operating protocol is described hereafter:

After providing a peripheral venous access and monitoring vital parameters (ECG, SpO2, NIBP, ETCO2, temperature by spot-on sensor) mild sedation with midazolam 0,03 mg/kg is performed. With patient in lateral decubitus position and operative side uppermost or sitting position, our ultrasound-assisted patient-tailored LPB block protocol starts with placing a convex probe in paravertebral position, longitudinal orientation, to localize L5 level in sagittal plane (*Figure 4*).

A low frequency convex probe (2-5 MHz) offers a wide acoustic window and high penetrance, thus optimizing visualization of anatomical structures and image quality respectively also in obese or unfavorable patients.

Once identified L5 level, probe is rotated 90 degrees to show a transverse plane image; L5 spinous process can be identified as a "shadow cone" in the center of the image (PS) while transverse processes (PT) can be recognized deeply and laterally and their depth from skin sonographically measured (*Figure 5*). Transverse processes are safe targets to get a needle contact, remembering that lumbar plexus usually lies 2-3 cm deeper.

To establish lateral needle entry point we refer to the "CUN" concept, a Traditional Chinese Medicine patient-tailored unit of measurement corresponding to the maximum width of patient's thumb finger (*Figure 6*).

Given that the bladder meridian point 26, located at 1,5 CUN laterally to the lower edge of L5 spinous process, if stimulated deeply with an acupuncture needle allows to reach the 3rd-4th-5th lumbar metamere (*Figure 7*) we can consider it a good target to reach lumbar plexus.

The 1,5 CUN measure (traditionally defined as the distance between the 2nd and 3rd paired fingers measured at the level of the distal interphalangeal joint of patient's non dominant hand) is then converted in centimeters.

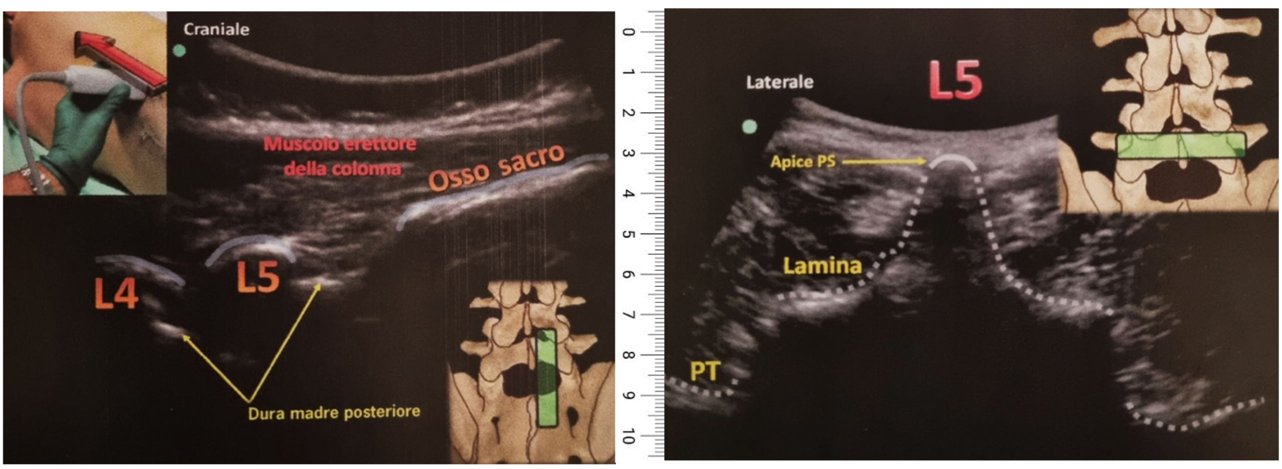

Figure 4 and 5. First and second step of our ultrasound-assisted protocol for lumbar plexus block. Figure 4 (left): L5 level localization. Figure 5 (right): L5 transverse process (PT) localization and depth from skin sonographic estimation.

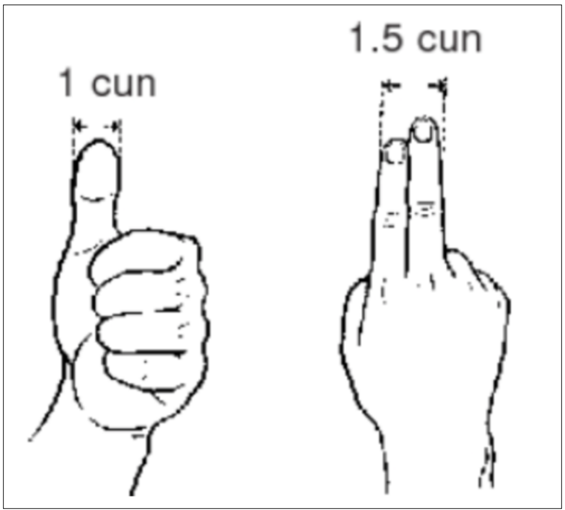

Figure 6. "CUN" concept.

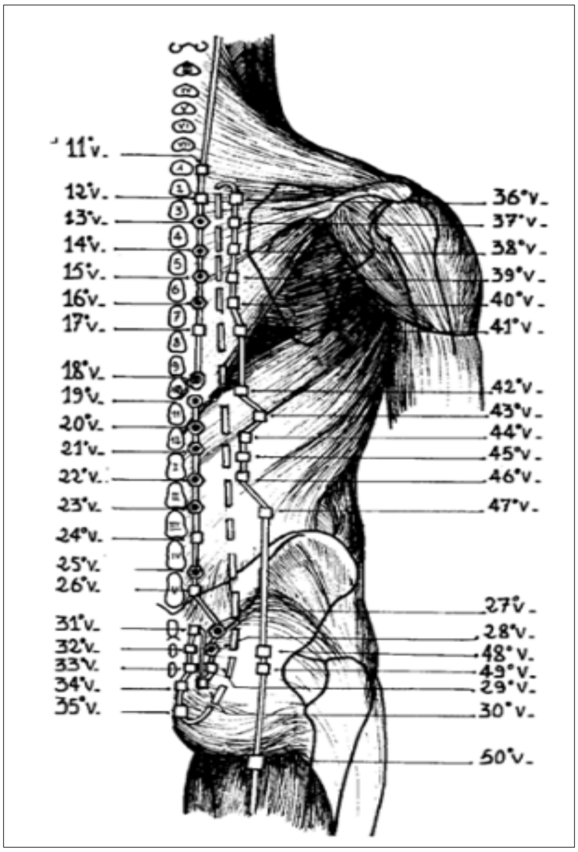

Figure 7. Bladder meridian point 26.

Puncture is finally carried out on L5 transverse process level (identified by ultrasound) with a lateral drift of 1.5 CUN (converted in centimeters) from the interspinous line, perpendicular to skin and expecting a bone contact at the previously sonographically estimated depth. After bone contact, needle is slightly cranially or laterally oriented to pass L5 transverse process advancing 2-3 cm deeper until ENS confirmation (patella twitches). A successfully and safely executed lumbar plexus block is defined by a patellar twitch evoked under an ENS stimulation between 0,2 and 0,5mA, negative blood, liquor or urine aspiration from needle before injection, positive Raj Test (defined by the loss of a motor response to ENS stimulation after 1 ml initial injection of local anesthetic) and no evoked pain during local anesthetic injection. Complete procedure is shown in *Figure 8*.

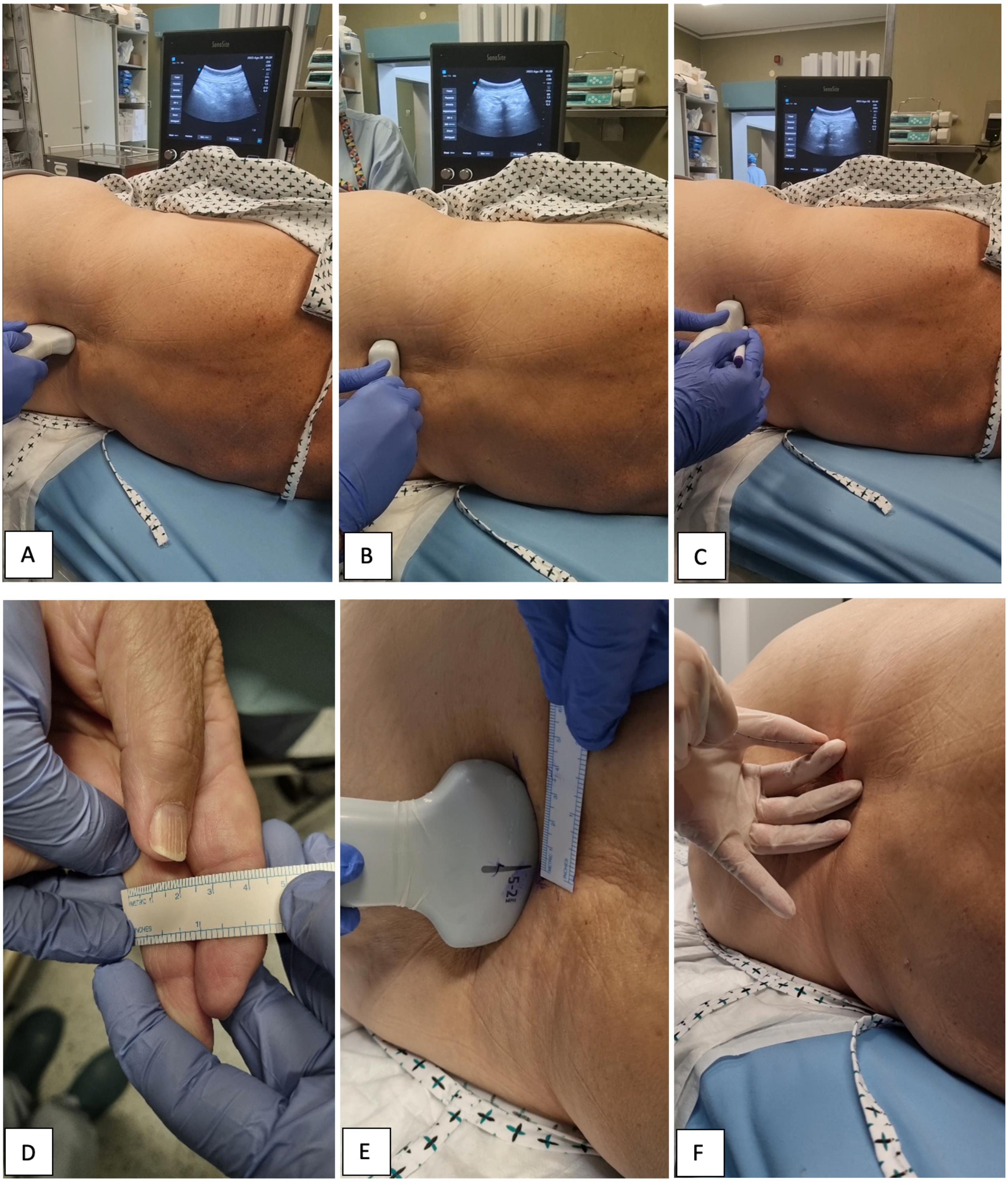

Figure 8. Ultrasound assisted patient-tailored Lumbar Plexus Block. **A**: paravertebral L5 level identification in sagittal plane. **B**: probe is then rotated 90° to show a transverse plane image; L5 spinous process is identified as a "shadow cone" in the center of the image, transverse processes can be recognized deeply and laterally and their depth from skin sonographically measured. **C**: probe's axes are marked on skin. **D**: the previously obtained 1,5 CUN measure is converted in centimeters. **E**: the 1,5 CUN measure from interspinous line is marked on skin, overlapping probe long axis which is parallel and aligned to L5 transverse process. **F**: puncture is carried out on this latest mark perpendicular to skin until bone contact, after which needle is slightly cranially or laterally oriented to pass L5 transverse process, advancing 2-3 cm deeper until ENS confirmation.

Results and discussion

Case history shows high reproducibility of our ultrasound-assisted patient-tailored Traditional Chinese Medicine based lumbar plexus block, which was performed with a success rate of 91,49% regardless of patients' age (55,32% of cases were 70 y.o. or older, age top value 84 y.o.) and BMI (27,66% of patients were class 1 obese or higher, BMI top value 39,4), both usually responsible for significant anatomical alterations capable of compromising reproducibility, success and safety of various locoregional anesthesia techniques in a "real world" scenario (Figure 9), regardless of sonography guidance. Our innovative technique failed, after puncture, in just 8,51% of cases; in these patients, a Chayen's approach was then also tried, failing aswell maybe due to patient's relevant anatomical alterations (all results are showed in Table 1).

VARIABLE	EVALUATION	N° (%)
Gender	Male Female	20 (42,55%) 27 (57,45%)
Age (years)	16-49 50-69 70-86	2 (4,25%) 19 (40,43%) 26 (55,32%)
BMI	< 30 > 30	34 (72,34%) 13 (27,66%)
Kind of surgery	Knee arthroplasty Hip arthroplasty Other	30 (63,83%) 13 (27,66%) 4 (8,51%)
1,5 CUN conversion (cm)	3 3,5 4 4,5 5	4 (8,51%) 6 (12,77%) 20 (42,55%) 11 (23,40%) 6 (12,77%)
L5 transverse process position match between Chayen's approach and sonography	Yes No	6 (12,77%) 41 (87,23%)
Lumbar plexus block success	Yes Yes, but a slightly different puncture site adjustment was needed Yes, but with Chayen's approach No	42 (89,36%) 1 (2,13%) 0 (0%) 4 (8,51%)
Needle puncture associated complications	Intrathecal injection Renal injury LAST Vascular injuries Nerve injury	0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%)

Table 1. Patients' data and results.

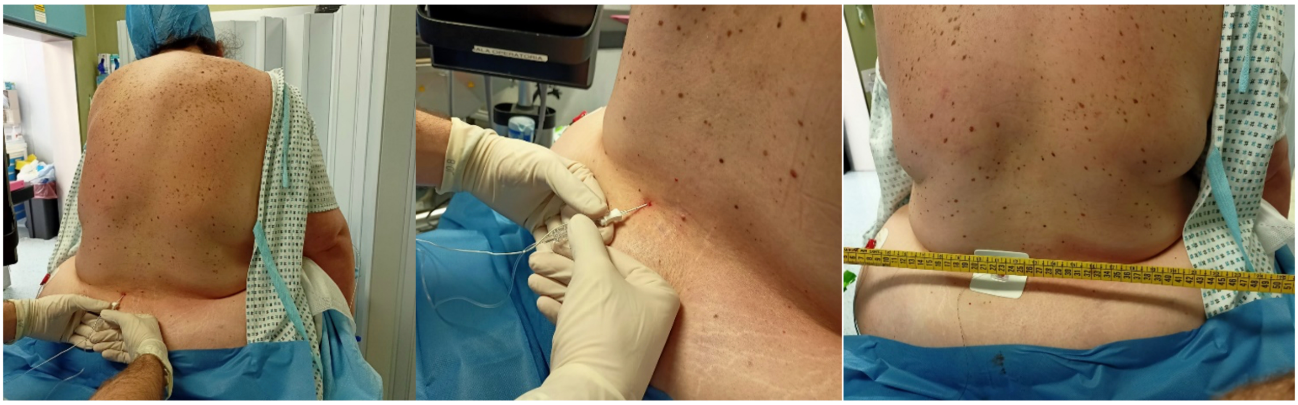

Figure 9. An example of our innovative lumbar plexus block approach on a common "real world" scenario.

Sonographic assistance showed how Chayen's approach target (L5 transverse process) is very rarely found where we would expect it: in 87,23% of cases there was no correspondence of its position under sonography, underlining how dangerous could a "blind block technique" be. Moreover, the distribution of data relating the conversion of 1,5 CUN into cm showed that lateral drift matches the 5 cm expected by the Chayen's approach in only 12,77% of cases, underlining the importance of a patient-anatomically-tailored approach. No needle puncture associated complications as intrathecal injection (liquor aspiration from needle and/or subarachnoid-like sensory effect), renal injury (hematuria and/or urine aspiration from needle), LAST, vascular injuries (hematomas or unexpected bleeding from puncture site) or nerve injuries (post-operative delayed anesthesia, paresthesia and/or motor deficiency) were found, confirming the efficacy of our "safety first" approach based on a quick and easy sonographic assistance (L5 transverse process and it's depth from skin identification), a patient-tailored Traditional Chinese Medicine based puncture site (1,5 CUN, converted in centimeters, lateral to interspinous line), needle bone contact , ENS confirmation (patellar twitch evoked under a stimulation between 0,2 and 0,5mA), negative blood, liquor or urine aspiration from needle before injection, positive Raj Test (defined by the loss of a motor response to ENS stimulation after 1 ml initial injection of local anesthetic) and no evoked pain during local anesthetic injection.

Conclusion

This preliminary study described an innovative and alternative ultrasound-assisted patient-tailored operating protocol to perform a safer and more consistent lumbar plexus block in lower limb surgery.

Our protocol involved an easy sonographic assistance and the use of patient-tailored alternative anatomical landmarks derived from Traditional Chinese Medicine. A quick sonographic identification of L5 process and its depth can be easily obtained even in obese patients or those with unfavorable anatomy, unlike known ultrasound-guided lumbar plexus blocks (i.e. Shamrock and Trident techniques) where deep target structures are rich, complex and usually poorly visible in a "real world" scenario, increasing the risk of complications and failures. Moreover, compared to the classic "blind method" (Tuffier line based anatomical landmarks) which doesn't consider anthropometric variants, the "1,5 CUN" measurement (and its conversion in cm) allowed a patient-tailored identification of the most appropriate paravertebral entry point for the electrostimulated needle.

Our approach, based on quick sonography and CUN measures combination, allowed us to increase lumbar plexus block safety and constancy of performance.

Disclosures:

The approval of the regional ethical committee is not requested for preliminary studies. Authors declare no funding for the production and publication of this article and no conflict of interest.

References

1. Analgesia for total hip and knee arthroplasty: a review of lumbar plexus, femoral and sciatic nerve blocks. Hogan MV, Grant RE, Lee L Jr. Am J Orthop (Belle Mead NJ). 2009 Aug;38(8):E129-33. PMID: 19809608 Review.
2. A Lumbar Paravertebral Space Ultrasound Plexus Block Technique for Hip Fracture Surgery in Elderly. Saranteas T et al. J Long Term Eff Med Implants. 2022;32(3): 65-71. PMID: 35993990.
3. A new rule for femoral nerve blocks, Schultz-Stübner S et al. Reg Anesth Pain Med. 2005 PMID: 16135352 Clinical Trial.
4. What is cun? Roboubi B. Reg Anesth Pain Med. 2006. PMID: 16418038
5. Xavier Capdevila, MD, PhD, Philippe Macaire, MD, Christophe Dadure, MD, Olivier Choquet, MD, Philippe Biboulet, MD, Yves Ryckwaert, MD et al. Continuous Psoas Compartment Block for Postoperative Analgesia After Total Hip Arthroplasty: New Landmarks, Technical Guidelines, and Clinical Evaluation. ANESTH ANALG 2002; 94; 1606–13.
6. S. T. Touray, M. A. de Leeuw, W. W. A. Zuurmond and R. S. G. M. Perez. Psoas compartment block for lower extremity surgery: a meta-analysis. British Journal of Anaesthesia; 2008; 101 (6): 750–60 3. Auroy Y, Benhamou D, Bargues L, Ecoffey C, Bruno Falissard B, Mercier F, Bouaziz H , Samii K. Major Complications of Regional Anesthesia in France. Anesthesiology 2002; 97:1274–80.
7. The Abbott pocket guide to practical peripheral nerve blockade. Nicholls, Conn and Roberts.
8. Sauter AR, Ullensvang K, Niemi G, et al: The Shamrock lumbar plexus block: A dose finding study. Eur J Anaesthesiol 2015; 32:764–770.
9. Karmakar MK, Li JW, Kwok WH, et al: Sonoanatomy relevant for lumbar plexus block in volunteers correlated with cross-sectional anatomic and magnetic resonance images. Reg Anesth Pain Med 2013;391–397.
10. Karmakar MK, Li JW, Kwok WH, Hadzic A: Ultrasound-guided lumbar plexus block using a transverse scan through the lumbar intertransverse space: a prospective case series. Reg Anesth Pain Med 2015;40:75–81.
11. Auroy Y, Benhamou D, Bargues L, Ecoffey C, Bruno Falissard B, Mercier F, Bouaziz H , Samii K. Major Complications of Regional Anesthesia in France. Anesthesiology 2002; 97:1274–80