Abstract

Amir Ibrahim Mohamed Salah*, Waleed Abd Elmageed Mohamed Eltaher**, Sabah Naguib Barsoom***,Omnia Sobhy Mousa AbdElmaksoud****

*Professor of Anesthesiology ,** Professor of Anesthesiology , ***Lecturer of Anesthesiology , ****MBCH .

Providing anesthetic care to the patient with a difficult airway keenly interests anesthesiologists and is a situation that often provokes much anxiety and trepidation. However, dealing effectively and safely with these patients is a skill that all anesthesiologists should be familiar with and are expected to perform with competency. While there are many methods that may be used to provide anesthesia to the airway, descriptions of these methods tend to be widely scattered throughout various textbooks and journals, and the choice of which method to use is often based on limited information, such as institutional tradition and personal experience. Therefore, we will cover the neuroanatomy of the upper airway and then describe several techniques that can be used to provide airway anesthesia.

As airway assessment, investigation and management becomes increasingly refined, the search for a single, reliable predictor of the difficult airway continues. A number of bedside tests are available to the anesthetists wishing to make an assessment for features which might predict potential airway difficulties. However, unexpected airway problems can arise despite the ever-increasing array of assessment tools available to us. This should be borne in mind at all times. No one test can predict airway difficulties with a high degree of sensitivity or specificity, but a combination of tests may be helpful. Careful assessment of the airway and consideration of more than one factor is therefore recommended.

Three major neural pathways supply sensation to airway structures; Terminal branches of the ophthalmic and maxillary divisions of the trigeminal nerve supply the nasal cavity and turbinates, the oropharynx and posterior third of the tongue are supplied by the glossopharyngeal nerve and Branches of the vagus nerve innervate

the epiglottis and more distal airway structures. The airway reflexes important for awake intubation are Gag reflex, Glottic closure reflex and cough reflex .

A calm and comfortable patient is much more likely to cooperate with the anesthesiologist during these procedures, thus making the process easier and more successful. Antisialogogues and vasoconstrictors for the nasal mucosa should be used before any airway instrumentation, in the absence of contraindications .

Topical anesthesia of the airway mucosa is generally accomplished by either some form of spraying of a local anesthetic solution onto the respiratory mucosa or by applying it directly to the mucosa itself. While nerve blocks are often more technically difficult to perform and generally carry a higher risk of complications (including bleeding, nerve damage, and intravascular injection) than the noninvasive methods, in experienced hands they are useful and provide excellent anesthesia and intubating conditions. There are 3 blocks are used to provide anesthesia to the upper airway: glossopharyngeal (oropharynx), superior laryngeal (larynx above the cords), and translaryngeal (larynx and trachea below the cords).

Current and potential applications of airway ultrasound including prediction of difficult airway evaluation of airway pathologies that may affect the choice of airway management prediction of size of endotracheal, endobronchial, and tracheostomy tubes airway related nerve blocks.

Faculty of medicine
Department of Anesthesiology,
Intensive Care and Pain Management

Novel Approaches For Ultrasound Guided Lower Limb Nerve Blocks

An Essay

Submitted for Partial Fulfillment of Master Degree in Anesthesia

By

Peter Boles Armeya Ghattas
M.B.B.CH Faculty of Medicine, Ain Shams University

Supervised By

Prof. Dr. Omar Mohamed Tahaa Abdallah Elsafty
Professor of Anesthesia, Intensive Care and Pain Management
Ain Shams University, Faculty of Medicine

Prof. Dr. Sherif Samir Wahba Rezk Allah
Professor of Anesthesia ,Intensive Care and Pain Management
Ain Shams University, Faculty of Medicine

Dr. Diaaeldein Mahmoud Haiba Ali
Lecturer of anesthesia , Intensive Care and Pain Management
Ain Shams University, Faculty of Medicine

Faculty of Medicine
Ain Shams University
2017

Introduction:

In 1880, French physicists called Pierre Curie, and his brother Jacques Curie, had discovered the piezoelectric effects in certain crystals. Paul Langevin, one of the students of Pierre Curie, had developed piezoelectric materials, which are capable of generating and receiving high frequency mechanical vibrations therefore these waves called ultrasound waves (**Daquan, 2012).**

The usage of ultrasound is increasingly present in the everyday life of any anesthesiologist. It can be used for deep vein access, peripheral nerve blocks and even for neuroaxial nerve blocks. The usage of ultrasound adds safety to the patients specially it decreases the risk of accidental vascular puncture during nerve blocks, and it helps to increase the rate of success of surgical procedures **(Martins, 2016).**

Ultrasound scan can offer many advantages when used to guide introduction of the needle for nerve blocks . It is noninvasive, safe, also simple to use, can be performed rapidly , provides real-time images, has no adverse effects, and it has many benefits in patients with abnormal or variant anatomy. When it is used for chronic pain interventions, ultrasound also eliminates or decreases exposure to radiation **(Chen et al., 2010).**

Ultrasound can be used in various fields of regional anesthesia and nerve blockage. It can be used as a tool for preoperative and postoperative pain management by blocking nerves responsible for pain in those who suffer from musculoskeletal diseases or cancer patients. Ultrasound can also be used for diagnostic or therapeutic purposes **(Narouze and Peng, 2010)**

Aim of the Essay :

The aim of this essay is to review novel approaches for ultrasound guided lower limb nerve blocks

Contents :

Chapter one:

Anatomy and physiology of lower limb nerves

The lumbar plexus lies deep within the psoas major muscle in front of the transverse processes of the lumbar vertebrae. It is formed by the ventral rami of the first three lumbar nerves and the greater part of the ventral ramus of the fourth nerve. All the branches of the plexus emerge from the substance of the psoas major ***(Moore et al., 2013).***

The first lumbar nerve, frequently supplemented by the 12th thoracic, splits into an upper and a lower branch; the upper and larger branch divides into the iliohypogastric and ilioinguinal nerves, the lower and smaller branch unites with a branch of the second lumbar nerve to form the genitofemoral nerve ***(Anne and Allison, 2010).***

The remainder of the second nerve, and the third and fourth nerves, divide into ventral and dorsal divisions the ventral division of the second unites with the ventral divisions of the third and fourth nerves to form the obturator nerve, the dorsal divisions of the second and third nerves divide into two branches, a smaller branch from each uniting to form the lateral cutaneous nerve of the thigh, and a larger branch from each joining with the dorsal division of the fourth nerve to form the femoral nerve ***(Moore et al., 2013).***

The iliohypogastric (L1) and ilioinguinal (L1) nerves emerge from the upper part of the lateral border of the psoas major muscle, initially together or separate throughout, with the former above the latter, they both pass laterally in front of the quadratus lumborum to enter the neurovascular plane between the transverse abdominis and internal oblique muscles ***(Chummy, 2011).***

The iliohypogastric nerve pierces the internal oblique about 2 cm medial to the anterior superior iliac spine and goes on to pierce the external oblique about 3 cm above the superficial inguinal ring (anterior cutaneous branch)It supplies sensation to suprapubic skin; a lateral cutaneous branch supplies posterolateral gluteal skin but the ilioinguinal nerve pierces the lower border of the internal oblique to enter the inguinal canal, which it leaves through the superficial ring to supply the skin of the anterior scrotum (mons pubis and labium majus), root of penis (clitoris), and upper medial thigh ***(Chummy, 2011).***

The genitofemoral nerve (L1,2) emerges from the anterior surface of the psoas major. Its genital branch enters the inguinal canal through the deep ring, and runs in the spermatic cord, supplying a small area of scrotal skin in males but in females, it accompanies the round ligament ***(Anne and Allison, 2010).***

The femoral branch passes down behind the inguinal ligament with the femoral artery (superficial and lateral to it), and pierces the femoral sheath and fascia lata to supply the skin over the femoral triangle, the lateral cutaneous nerve of the thigh (lateral femoral cutaneous nerve) arises from the dorsal divisions of the second and third lumbar nerves. It emerges from the lateral border of the psoas major about its middle, and crosses theiliacus muscle obliquely toward the anterior superior iliac spine. It passes under the inguinal ligament and over the sartorius muscle into the thigh ***(Moore et al., 2013).***

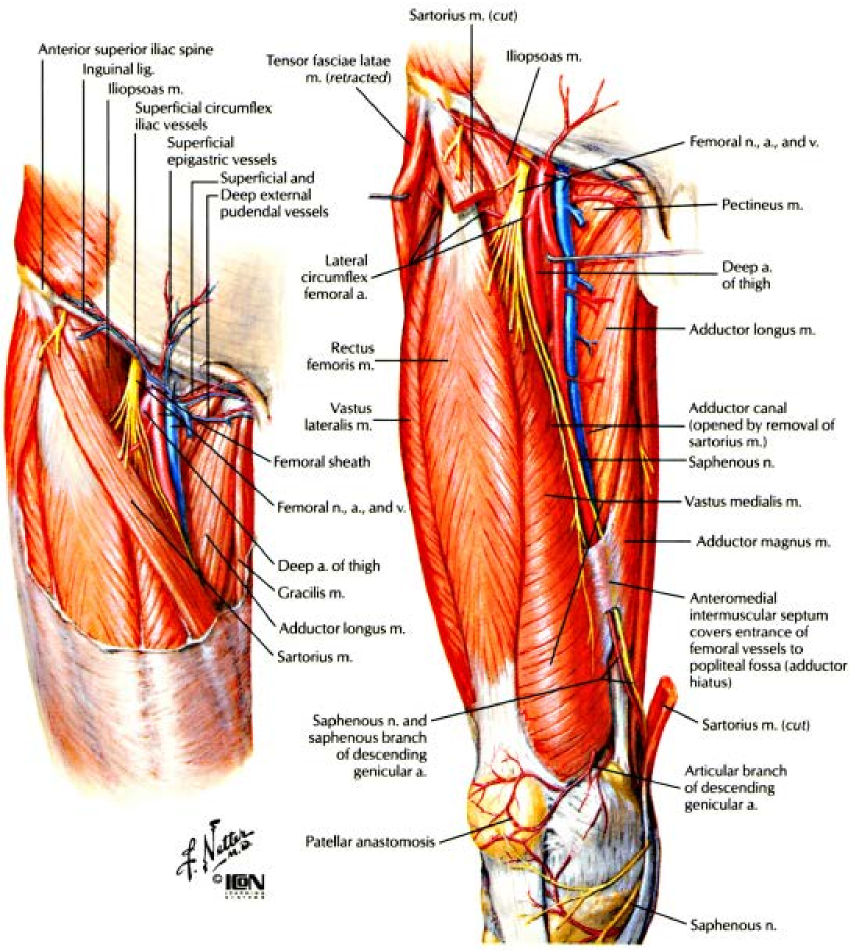
The lateral cutaneous nerve of the thigh divides into two branches:

- The anterior branch becomes superficial about 10 cm below the inguinal ligament and divides into branches, which are distributed to the skin of the anterior and lateral parts of the thigh as far as the knee
- The posterior branch pierces the fascia lata and subdivides into branches, which pass backward across the lateral and posterior surfaces of the thigh, supplying the skin from the

level of the greater trochanter to the level of the middle of the thigh***(Richard et al., 2009).***

- The femoral nerve, the largest branch of the lumbar plexus, arises from the dorsal divisions of the second, third, and fourth lumbar nerves. It descends through the fibers of the psoas major, emerging from the muscle at the lower part of its lateral border, and passes down between it and the iliacus muscle, behind the iliac fascia; it then runs beneath the inguinal ligament into the thigh, and splits into an anterior and a posterior division ***(Richard et al., 2009).***

In the thigh, the anterior division of the femoral nerve gives off anterior cutaneous and muscular branches. The anterior cutaneous branches are the intermediate and medial cutaneous nerves , the intermediate cutaneous nerve pierces the fascia lata (and generally the sartorius) about 7.5 cm below the inguinal ligament, and divides into two branches that descend in immediate proximity along the forepart of the thigh to supply the skin as low as the front of the knee , the branches of the posterior division of the femoral nerve are the saphenous nerve and branches to quadriceps femoris and the knee joint***(Harold , 2006).***

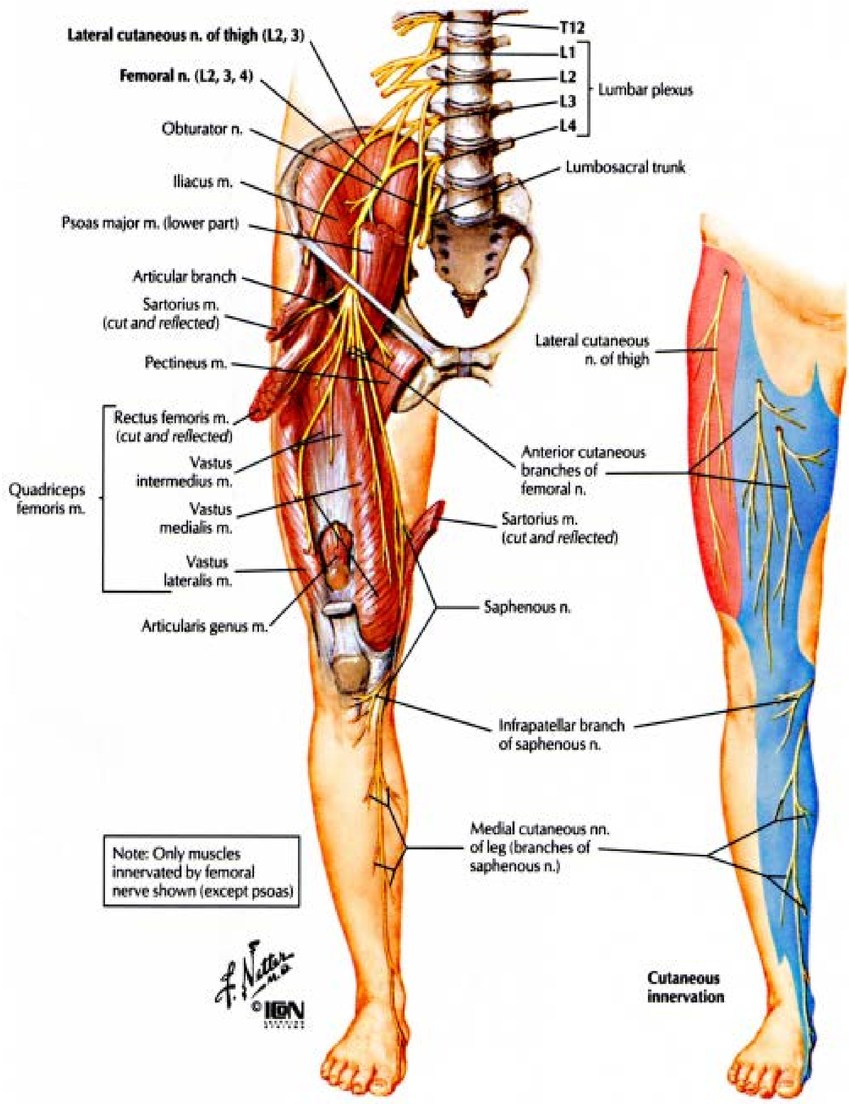


Figure(1): Femoral nerve ***(John and David, 2005).***

The saphenous nerve is the largest and longest cutaneous branch of the femoral nerve. It descends lateral to the femoral artery in the femoral triangle and enters the adductor canal, where it crosses in front of the artery to lie medial to the artery, at the distal end of the canal it leaves the artery and emerges through the aponeurotic covering with the saphenous branch of the descending genicular artery ***(Harold, 2006).***

When the saphenous nerve leaves the adductor canal it gives off an infrapatellar branch that contributes to the peripatellar plexus and then pierces the fascia lata between the tendons of sartorius and gracilis, becoming subcutaneous to supply the prepatellar skin. It descends along the medial tibial border with the long saphenous vein and divides distally into a branch which continues along the tibia to the ankle and a branch which passes anterior to the ankle to supply the skin on the medial side of the foot, often as far as the first metatarsophalangeal joint, the saphenous nerve connects with the medial branch of the superficial fibular nerve, near mid-thigh, and also it gives a branch to the subsartorial plexus ***(Sausan and Neil, 2008).***

The subsartorial plexus is formed by medial cutaneous nerve of the thigh and also with branches of the saphenous and obturator nerves, deep to the fascia lata, at the lower border of adductor longus it usually supplies the skin on the medial side of the thigh ***(Sausan and Neil, 2008).***



Figure(2): Lumbar plexus***(John and David, 2005).***

The sacral plexus is formed by the anterior sacral roots from S1 to S3, and the lumbar roots from L5 are associated with an anastomotic branch from L4 (furcal nerve). The L5 roots and the L4 anastomotic branch form the lumbosacral trunk the lumbosacral trunk and the sacral roots converge toward the sciatic foramen and merge before entering the buttock ***(Laura, 2009).***

The sacral plexus is shaped like a triangle, with its base lying against the anterior sacral foramina and its vertex corresponding to the anteromedial border of the sciatic foramen, the sacral plexus transverses the sciatic foramen lying anterior to the piriformis muscle and is covered by the pelvic aponeurosis (corresponding to the fascia of the pelvic muscles), which separates it from the visceral structures of the pelvis ***(John and David, 2005).***

The sciatic nerve is one of the major branches of the sacral plexus , it descends into the posterior compartment of thigh from the gluteal region It innervates the muscles in the posterior compartment of thigh and then its branches continue into the leg and foot , in the posterior compartment of thigh the sciatic nerve lies on the adductor magnus muscle and it is crossed by the long head of the biceps femoris muscle ,proximal to the knee, and sometimes within the pelvis, the sciatic nerve divides into its two terminal branches which are the tibial nerve and the common fibular nerve (common peroneal nerve) ***(Richard et al., 2009)***.