Combined ultrasound imaging and hydrolocalization technique for accurate placement of perineural catheters

Editor—Although continuous peripheral nerve blocks have become increasingly popular, a major concern is the accurate placement of perineural catheters in proximity to the nerves.1–4

Therefore, we developed a simple method for the accurate perineural catheter placement based on combined ultrasound guidance and hydrolocalization technique.

After the institutional Ethics Committee (Attikon University Hospital, Athens, Greece) approval, written consent was obtained from 18 patients, undergoing orthopaedic surgery of the foot, ankle, or both. The primary objective was to place the perineural catheter exactly underneath the targeted nerve. Patients were placed in the prone position and the popliteal-sciatic nerve was seen in the short-axis ultrasound view (Vivid I; GE Healthcare, WI, USA) with a 4–12 MHz linear transducer. An insulated needle was advanced under ultrasound guidance (in-plane technique) until the needle tip was seen precisely under the targeted nerve. The distance from the skin surface to the needle tip was measured and registered as distance ‘D’ (Fig. 1A). The needle was then advanced for 2–3 cm beyond the targeted nerve (Fig. 1B).

![Diagram](image)

**Fig 1** Schematic presentation of the combined ultrasound imaging and hydrolocalization technique used for the placement of perineural catheters. (a) Needle is positioned under the targeted nerve and the distance of needle tip to skin surface ‘D’ is measured. (b) Further advance of the needle tip beyond the targeted nerve ensures that in the subsequent catheter insertion, there would be enough space for catheter retraction without the need to reposition the needle, the catheter, or both. (c) The catheter is gradually retracted in position ‘D’ and hydrolocalization technique with local anaesthetic (LA) injected exactly underneath the targeted nerve, confirms the precise placement of catheter tip under the nerve structure. Inset: Two-dimensional ultrasound image of circumferential spread of the LA (arrows) around the sciatic nerve. S, sciatic nerve.
and a 20 G, single outlet, 40 or 50 cm catheter (B/Braun Mel- 
sungen, Germany or Pajunk, Geisingen, Germany) was inserted 
and advanced 5 cm beyond the needle tip. The catheter was, 
then, gradually retracted while normal saline was injected 
simultaneously, until the distance of the catheter tip to skin 
surface was equal to ‘D’. Hydrolocalization with normal 
saline being injected exactly underneath the targeted nerve 
confirmed the precise placement of the catheter tip under 
the nerve structure (Fig. 1C). At this point, 15 ml of ropivacaine 
0.5% and 15 ml of lidocaine 1.5% were given. The quality of 
sensory block was evaluated every 10 min for up to 40 min 
and rated as: 0, 1, and 2 for normal, partial, and complete 
sensory nerve block. The sensory nerve block was successful 
if there was a complete absence of pinprick sensation in the 
tibial and common peroneal nerve distribution (plantar 
surface and dorsal surface of the foot). After an adequate 
nerve block was achieved, infusion of ropivacaine 0.2% at 5 
ml h⁻¹ was commenced. After operation, the degree of pain 
at rest and on movement was assessed by using a 10 cm 
visual analogue scale (VAS) at 12, 24, and 36 h. Patients with 
VAS >4 were given a 10 ml bolus of ropivacaine 0.2% 
through the catheter and the rate of infusion was increased 
to 7 ml h⁻¹. If 1 h later pain scores still exceeded 4, another 
10 ml bolus was given through the sciatic catheter and the 
infiltration rate was increased to 10 ml h⁻¹.

Of the 18 patients [7/11 female/male, 42 (72) yr, 71 (13) 
kg], seven had hallux vagus repair, eight ankle fracture fix-
at, and three tibial fracture fixation. In all cases, the cath-
eter tip was accurately placed under the sciatic nerve (saline 
injection was always seen exactly posterior to the targeted 
nerve). After operation, in two of 18 patients, one with 
hallux vagus repair and one with tibial fracture fixation, 
nerve block was achieved, infusion of ropivacaine 0.2% at 5 
ml h⁻¹ was commenced. After operation, the degree of pain 
at rest and on movement was assessed by using a 10 cm 
visual analogue scale (VAS) at 12, 24, and 36 h. Patients with 
VAS >4 were given a 10 ml bolus of ropivacaine 0.2% 
through the catheter and the rate of infusion was increased 
to 7 ml h⁻¹. If 1 h later pain scores still exceeded 4, another 
10 ml bolus was given through the sciatic catheter and the 
infiltration rate was increased to 10 ml h⁻¹.

In conclusion, combined ultrasound imaging and hydrolo-
calization technique can lead to the very accurate placement 
of perineural catheters. By using these three manoeuvres, (i) 
noodle positioning under the sciatic nerve ‘D’, (ii) needle 
advancement beyond the targeted nerve, and (iii) catheter 
retraction back to ‘D’, we can place the catheter exactly 
underneath the targeted nerve.

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Prone ventilation for refractory hypoxaemia in a patient with severe chest wall disruption and traumatic brain injury

Editor—Adult respiratory distress syndrome (ARDS) carries a 
high mortality of up to 50%.1 Numerous therapies have 
been postulated in the treatment of this condition. Among 
them is ventilation in the prone position which, although 
first discussed in the 1970s,2 has only relatively recently 
been demonstrated to have an outcome benefit, albeit only 
in the sickest of patients.3

We recently encountered a case of a previously fit 
50-yr-old man who sustained severe chest and head injuries 
in a motorcycle accident. He suffered a 10 min cardiorespira-
tory arrest at the scene and was resuscitated after bystander 
cardiopulmonary resuscitation and subsequent advanced life 
support (ALS) by paramedics. On arrival at hospital, bilateral 
pleurothoraces with multiple rib fractures, a large right-
sided flail segment, and comminuted sternal fracture were 
discovered. He also sustained diffuse axonal injury, basal 
skull fractures, and subdural and subarachnoid haemor-
rhages. He was transferred to our care at the regional neuro-
surgical centre.

In the ensuing days, pulmonary contusions developed into 
ARDS and this was compounded by a ventilator-associated 
pneumonia. His head injury was managed non-surgically, 
although intracranial pressure management required 
sedation, paralysis, and osmotherapy. Oxygenation and 
ventilation became critical despite maximal conventional 
ventilatory therapy and on day 6, he reached a nadir with a 
Pao2 of 5.5 kPa and a Paco2 of 10.1 kPa on an FiO2 of 1.0 
and a PEEP of 15 cm H2O. He was turned prone, despite his 
injuries and bilateral chest drains (the latter being noted in a 
recent meta-analysis3 as one source of potentially signifi-
cant complications), and within 1 h, a dramatic improvement 
was noted in lung function indices (Table 1). Effects on intra-
cranial pressure were moderate but very transient, resolving 
shortly after the position change. After 20 h, he was turned 
supine and went on to make a slow but near-complete 
eurological and respiratory recovery.

Prone ventilation has been used in a pregnant patient with 
several simple rib fractures.4 There has also been a series of 
eosophagectomy patients successfully managed in this way