LÉSIONS D'ORIGINE ANESTHÉSIQUE: UNE ACCUMULATION DE FACTEURS…

Pathophysiology and Etiology of Nerve Injury Following Peripheral Nerve Blockade

Richard Brull, MD, FRCPC, Admir Hadzic, MD, PhD,† Miguel A. Reina, MD, PhD,‡ and Michael J. Barrington, PhD, MBBS, FANZCA§*

Regional Anesthesia and Pain Medicine • Volume 40, Number 5, September-October 2015

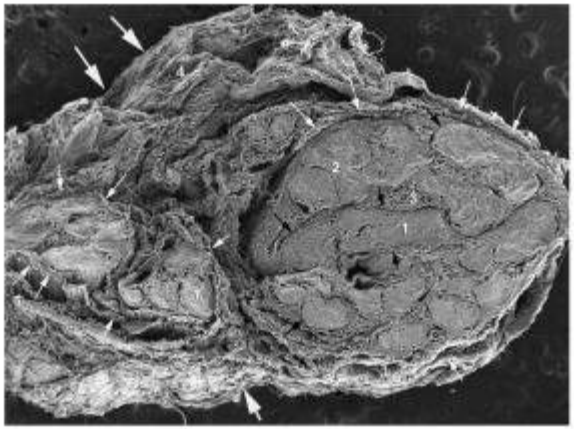
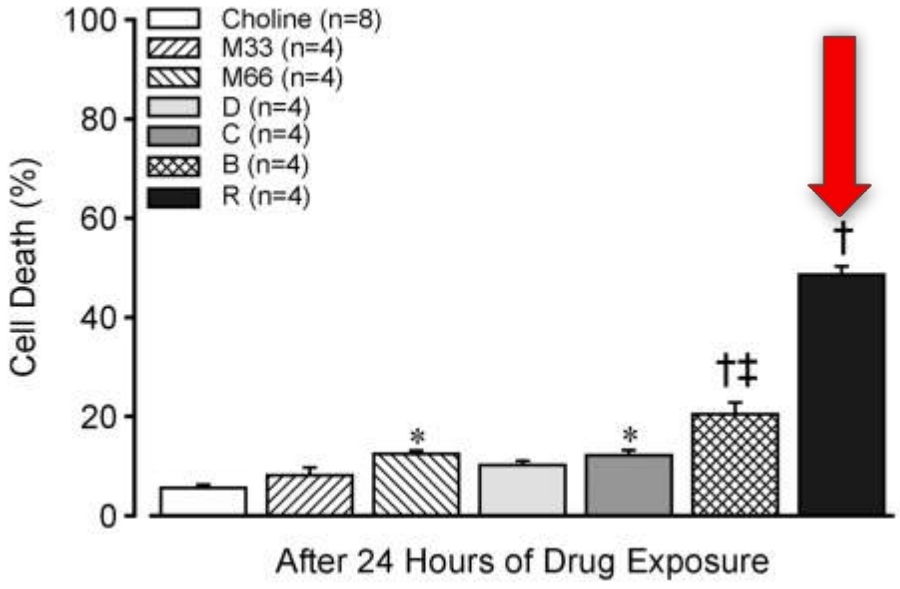


FIGURE 3. Electron microscopic image of the human sciatic nerve. Shown are tibial nerve (right) and common peroneal nerve (left). 1: Example of fascicles. 2: Example of fascicular bundles (≥2 fascicles bound together). 3: Example of interfascicular tissue. 4: Extraneural connective tissue layer surrounding both the tibial and peroneal nerves. Large white arrows: extraneural layer of connective tissue surrounding the sciatic nerve. Small white arrows: epineurium of tibial nerve (right) and common peroneal nerve (left). Black arrows: examples of perineurium.

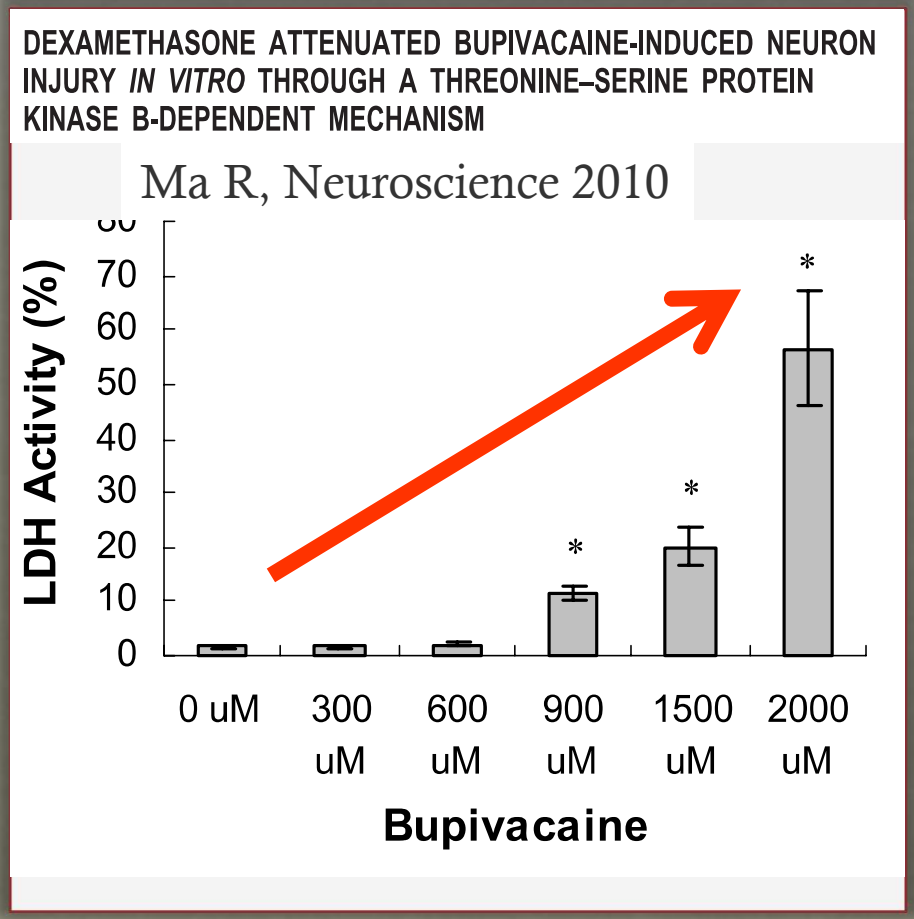
Neurotoxicity of Adjuvants used in Perineural Anesthesia and Analgesia in Comparison with Ropivacaine

Brian A. Williams, MD, MBA*,†,‡, Karen A. Hough, AS, CVT, RLAT*,†, Becky Y. K. Tsui, MPH, James W. Ibinson, MD, PhD*,†,‡, Michael S. Gold, PhD*,†, and G.F. Gebhart, PhD*,†

Reg Anesth Pain Med. 2011 ; 36(3): 225–230. doi:10.1097/AAP.0b013e3182176f70.



LIMITER LA NEUROTOXICITE



MEAC 90

- **Lidocaïne: 0,93%**

Lidocaine use in US-guided femoral nerve block: what is the minimum effective anaesthetic concentration (MEAC90) ?Taha & al BJA 2013

- **Ropivacaïne: 0,167%**

Ropivacaine in US-guided femoral nerve block: what is the minimal effective anaesthetic concentration (EC90)? Taha & al Anaesthesia 2014

- **Bupivacaïne:0,25%**

Effect of concentration of local anaesthetic solution on the ED50 of bupivacaine for supraclavicular brachial plexus block Gupta & al BJA 2013

INJECTER AU BON ENDROIT

High-Definition Ultrasound Imaging Defines the Paraneural Sheath and the Fascial Compartments Surrounding the Sciatic Nerve at the Popliteal Fossa

Manoj Kumar Karmakar, MD, Ali Nima Shariat, MD,† Pawinee Pangthipampai, MD,* and Junping Chen, MD†*

Regional Anesthesia and Pain Medicine • Volume 38, Number 5, September-October 2013

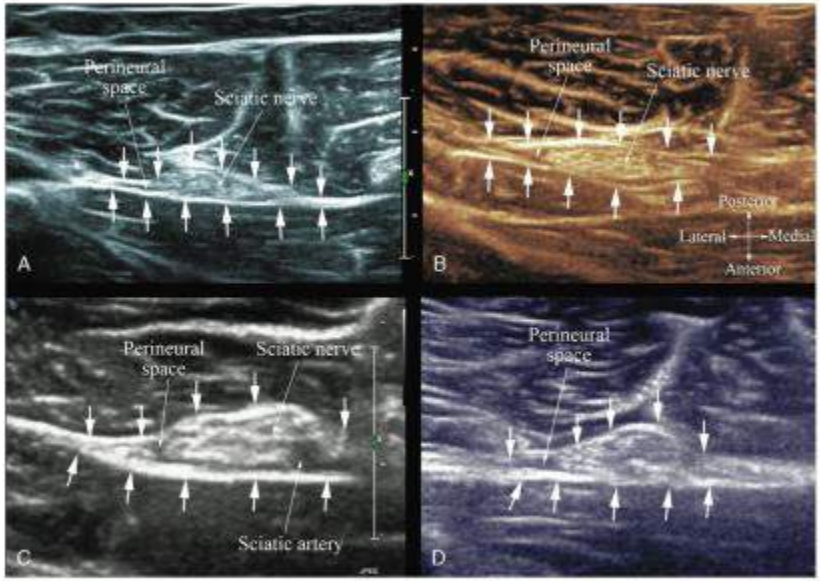


FIGURE 1. Transverse sonogram of the sciatic nerve from just above the apex of the popliteal fossa in the 4 patients. The sciatic nerve is seen as a hyperechoeic structure within a narrow hypoechoeic space (perineural space) between the hyperechoeic epimysium (short white arrows) of the adjacent muscles. Note the sciatic artery anterior to the sciatic nerve in (C).

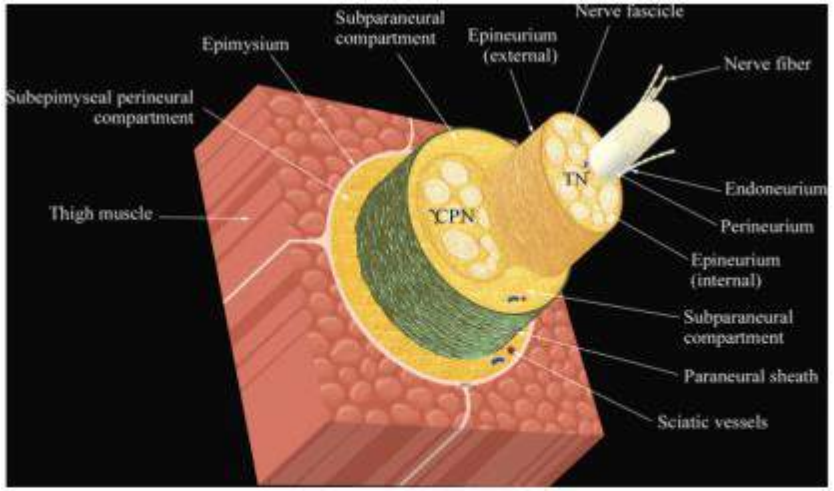
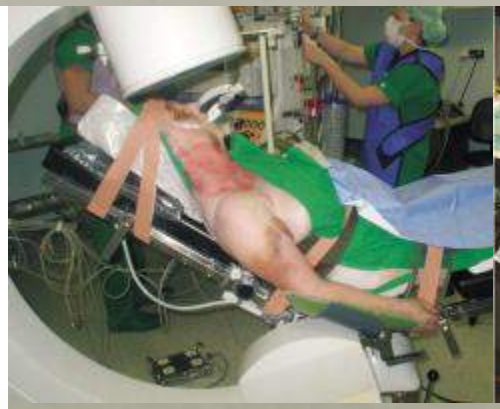
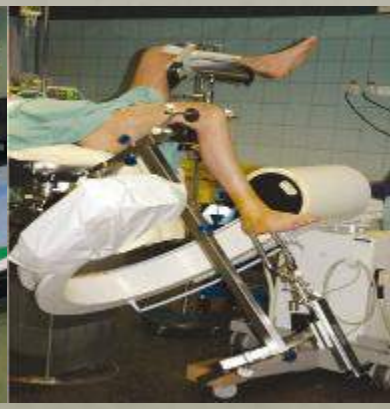


FIGURE 4. Schematic diagram illustrating the functional anatomy of the sciatic nerve, paraneural sheath, and the fascial compartments that surround the sciatic nerve, before its bifurcation into the common peroneal (CPN) and tibial (TN) nerves, at the popliteal fossa.

LA CONTUSION NERVEUSE





Nerf Ulnaire et Nerf Radial

Nerf Fibulaire et
Nerf Pudendal

LE GARROT

Postmeniscectomy tourniquet palsy and fonctional sequelae
Dobner JJ, Nitz AJ.
Am J Sports Med 1982 Jul-Aug; 10(4):211-4

42 min de Garrot. Signes de dénervation chez 71% de patients

Anesthetic, Patient, and Surgical Risk Factors for Neurologic Complications After Prolonged Total Tourniquet Time During Total Knee Arthroplasty

Terese T. Horlocker, MD, James R. Hebl, MD, Bhargavi Gali, MD, Christopher J. Jankowski, MD, Christopher M. Burkle, MD, Daniel J. Berry, MD, Fernando A. Zepeda, MD, Susanna R. Stevens, BS, and Darrell R. Schroeder, MS

Departments of Anesthesiology, Orthopedic Surgery, and Health Sciences Research, Mayo Clinic, Rochester, Minnesota

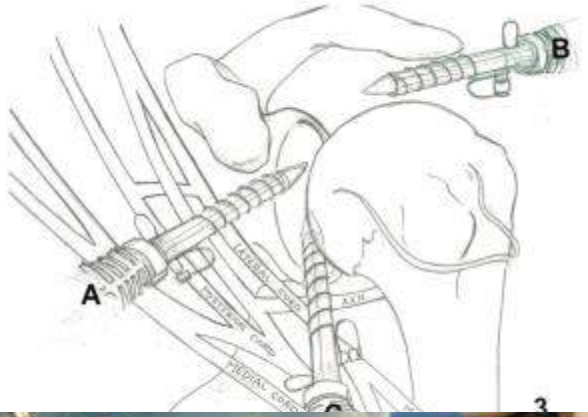
Anesth Analg 2006;102:950–5

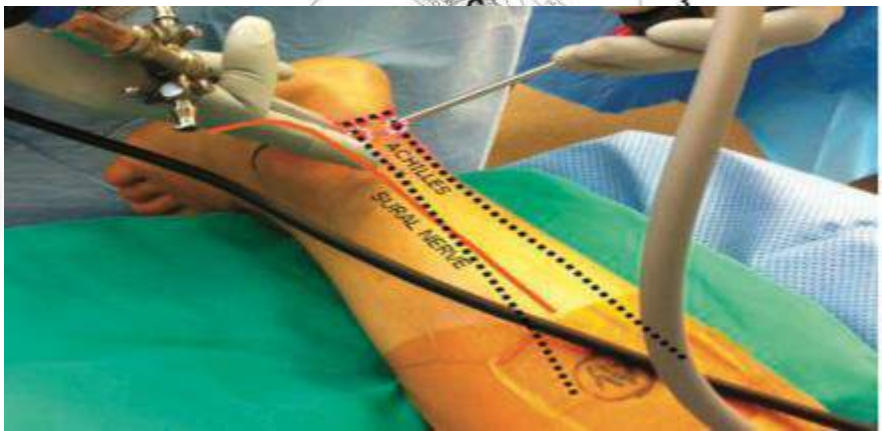
LA LÉSION DIRECTE

Neurological Complications Related to Elective Orthopedic Surgery

Part 1: Common Shoulder and Elbow Procedures

Tim Dwyer, MBBS, FRACS, FRCSC,†‡§ Patrick D. G. Henry, MD, FRCSC,§|| Phantila Cholvisudhi, MD,§¶ Vincent W. S. Chan, MD, FRCPC, FRCA,§¶ John S. Theodoropoulos, MD, MSc, FRCSC,*†‡§ and Richard Brull, MD, FRCPC§¶*





L'ÉLONGATION

ORIGINAL ARTICLE

MAYO CLINIC

Ipsilateral Inflammatory Neuropathy After Hip Surgery

Ruple S. Laughlin, MD; P. James B. Dyck, MD; James C. Watson, MD; Robert J. Spinner, MD; Kimberly K. Amrami, MD; Rafael J. Sierra, MD; Robert T. Trousdale, MD; and Nathan P. Staff, MD, PhD

Mayo Clin Proc. ■ April 2014;89(4):454-461 ■ http://dx.doi.org/10.1016/j.mayocp.2013.10.027
www.mayoclinicproceedings.org ■ © 2014 Mayo Foundation for Medical Education and Research

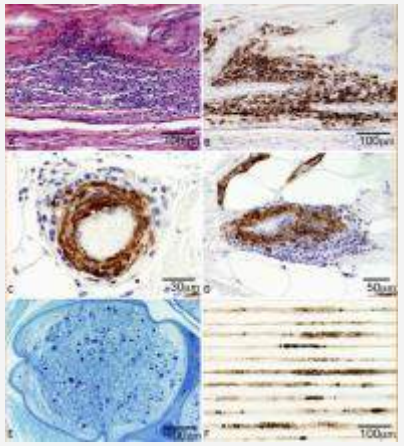


TABLE 2. Imaging Findings in Patients With Neuropathy After Hip Surgery

Patient No.	Procedure	MRI	Magnet strength (Tesla)	Nerves involved on imaging	T2 signal	Nerve enlargement	Nerve enhancement
1	THA	Lumbosacral plexus	3	R sciatic	Increased	Moderate	None
2	THA	Lumbosacral plexus	3	L sciatic	Increased	Mild	None
3	THA	Lumbosacral plexus	3	R sciatic > L sciatic	Increased	Moderate/mild	None
4	Femur nail	Lumbosacral plexus	1.5	R LS plexus, R sciatic > L sciatic	Increased	Moderate/mild	None
5	Periacetabular osteotomy	Lumbosacral plexus	1.5	L sciatic > R sciatic, L femoral, L lateral femoral cutaneous	Increased	Mild	None
6	THA	Lumbosacral plexus/sciatic	3	R LS plexus and R sciatic > L LS plexus and L sciatic, bilateral femoral	Increased	Mild	None
7	THA (bilateral)	Lumbosacral plexus	1.5	L sciatic > R sciatic	Increased	Moderate/mild	None

F = focal fiber loss; H = hemosiderin; L = left; LS = lumbosacral; N = neovascularization; P = perineurial damage; THA = total hip arthroplasty.

TABLE 3. Pathologic Findings in Patients With Neuropathy After Hip Surgery

Patient No.	Procedure	Biopsied nerve	$CD45^+$ epineurial inflammation	Ischemic damage	Diagnosis of microvasculitis
1	THA	Superficial fibular	Large	H, N, F, P	Yes
2	THA	Sural	Moderate	N, F, P	Yes
3	THA	Superficial fibular	Large	H, P	Yes
4	Femur nail	Sural	Moderate	H, N	Yes
5	Periacetabular osteotomy	Saphenous	Moderate	H, F, P	No
6	THA	Sural	Large	H, N, F, P	Yes
7	THA (bilateral)	L sural	Large	P	Yes

F = focal fiber loss; H = hemosiderin; L = left; N = neovascularization; P = perineurial damage; THA = total hip arthroplasty.

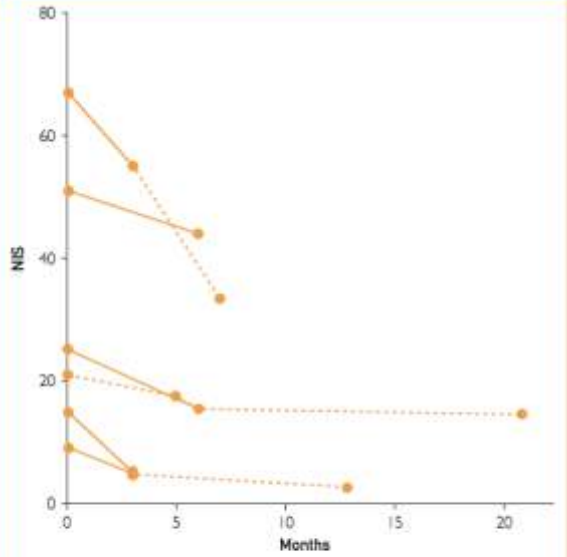


FIGURE 2. Neuropathy Impairment Scores (NISs) of 6 patients with inflammatory neuropathy after hip surgery plotted with time. Each line represents a different patient. Closed circles represent patient evaluations; solid lines, treatment periods (intravenous methylprednisolone, 1 g weekly for 12 weeks); and dotted lines, time without treatment. Without exception, NISs improved (ie, scores decreased; $P=.03$).

1ÈRE CONSULTATION

QUESTIONNAIRE DN4 : un outil simple pour rechercher les douleurs neuropathiques

Pour estimer la probabilité d'une douleur neuropathique, le patient doit répondre à chaque item des 4 questions ci dessous par « oui » ou « non ».

QUESTION 1 : la douleur présente-t-elle une ou plusieurs des caractéristiques suivantes ?

	Oui	Non
1. Brûlure	☐	☐
2. Sensation de froid douloureux	☐	☐
3. Décharges électriques	☐	☐

QUESTION 2 : la douleur est-elle associée dans la même région à un ou plusieurs des symptômes suivants ?

	Oui	Non
4. Fourmillements	☐	☐
5. Picotements	☐	☐
6. Engourdissements	☐	☐
7. Démangeaisons	☐	☐

QUESTION 3 : la douleur est-elle localisée dans un territoire où l'examen met en évidence :

	Oui	Non
8. Hypoesthésie au tact	☐	☐
9. Hypoesthésie à la piqûre	☐	☐

QUESTION 4 : la douleur est-elle provoquée ou augmentée par :

	Oui	Non
10. Le frottement	☐	☐

OUI = 1 point **NON = 0 point** **Score du Patient : /10**

MODE D'EMPLOI

Lorsque le praticien suspecte une douleur neuropathique, le questionnaire DN4 est utile comme outil de diagnostic.

Ce questionnaire se répartit en 4 questions représentant 10 items à cocher :

- ✓ Le praticien interroge lui-même le patient et remplit le questionnaire
- ✓ A chaque item, il doit apporter une réponse « oui » ou « non »
- ✓ A la fin du questionnaire, le praticien comptabilise les réponses, 1 pour chaque « oui » et 0 pour chaque « non ».
- ✓ La somme obtenue donne le Score du Patient, noté sur 10.

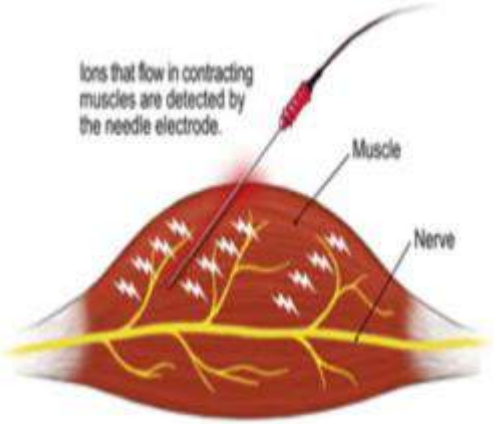
Si le score du patient est égal ou supérieur à 4/10, le test est positif (sensibilité à 82,9 % ; spécificité à 89,9 %)

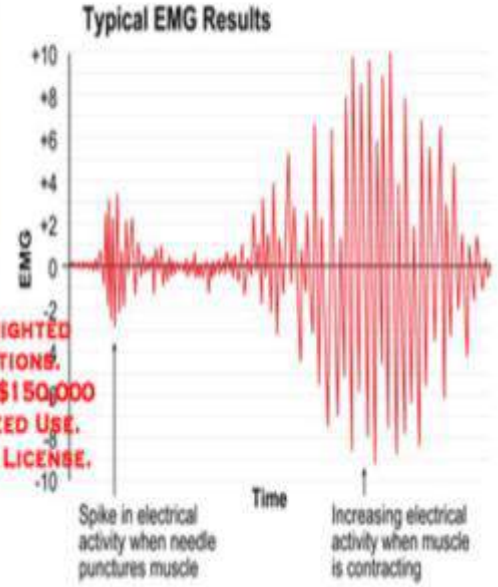
D'après Bouhassira D *et al. Pain* 2004 ; 108 (3) : 248-57.

CAS CLINIQUE

- Patient 69 ans; PTG sous ALR (bloc fémoral + bloc sciatique) et AG.
- A 1mois le patient est revu par le chirurgien.
- Paralysie des releveurs du pied, qui a récupéré depuis 1 semaine. Paresthésie de la face latérale de la jambe et du dos du pied.
- Examen médical. Pas de lésion motrice. Pas de paresthésie de la plante du pied.
- Etiologie?

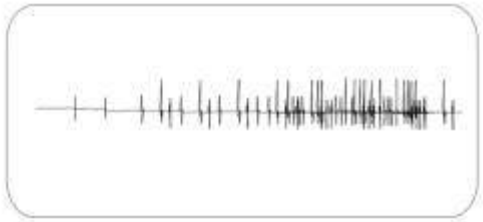
EMG DE DETECTION



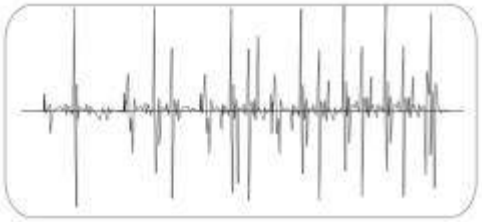


Tracé Normal

Repos | Effort modéré | Effort maximal



Atteinte Neurogène (stade aigu)



Atteinte Neurogène (stade chronique)

Novembre 2006

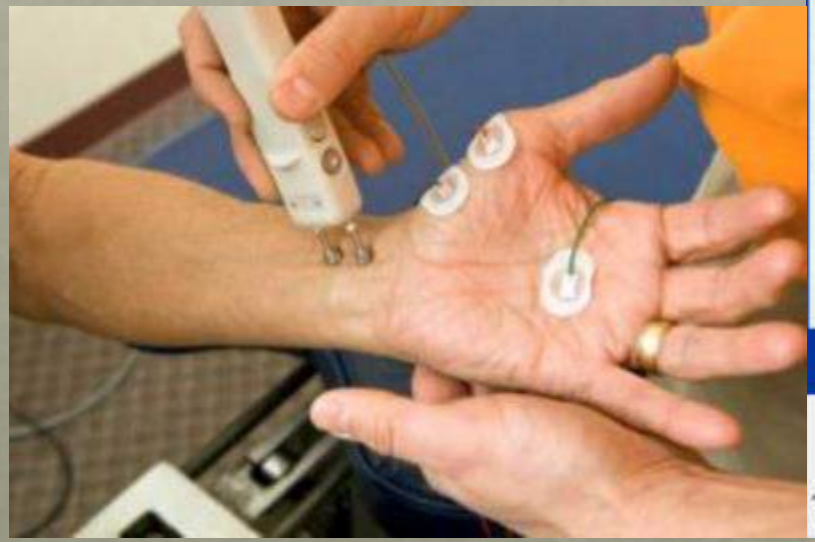
Antonia Pérez-Martin, Iris Schuster, Michel Dauzat
Faculté de Médecine Montpellier-Nîmes
en partenariat avec les Editions SAURAMPS Médical - Montpellier

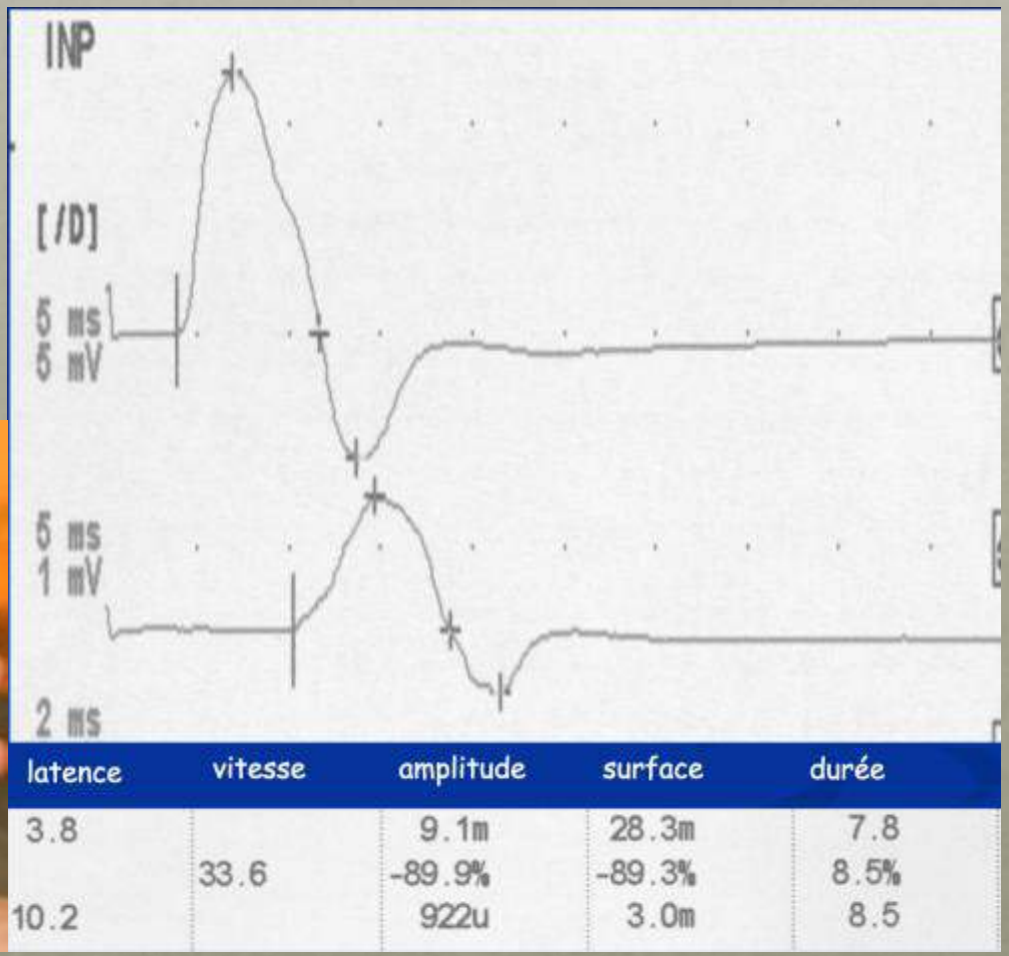
CAS CLINIQUE

- Patiente 32 ans opérée d'une ligamentoplastie du genou droit sous ALR; garrot cuisse 40 min.
- A J+1, paralysie complète du quadriceps.
- E.M.G. en urgence: Atteinte myogène du quadriceps
- IRM: Rhabdomyolyse majeure du quadriceps

VITESSES DE CONDUCTION

- Vitesse de conduction normale: 45 m/s MS 40 m/s MI
- Recherche un délai de latence ou un bloc de conduction
- Recherche de la localisation de la lésion

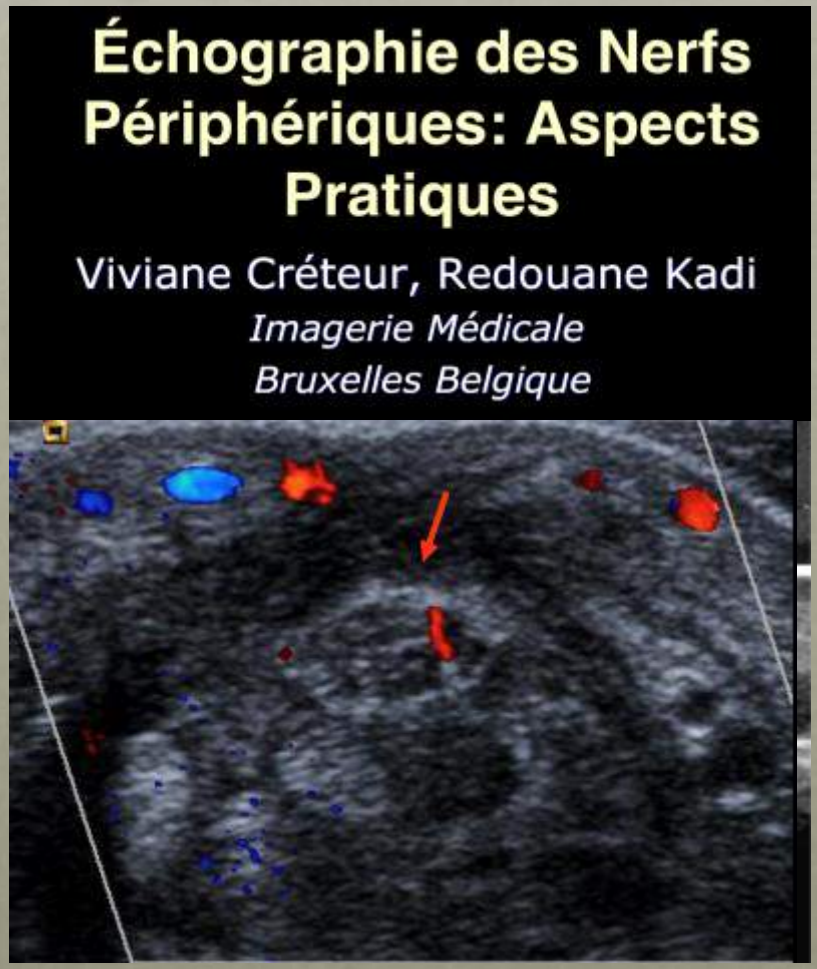




latence	vitesse	amplitude	surface	durée
3.8		9.1m	28.3m	7.8
	33.6	-89.9%	-89.3%	8.5%
10.2		922u	3.0m	8.5

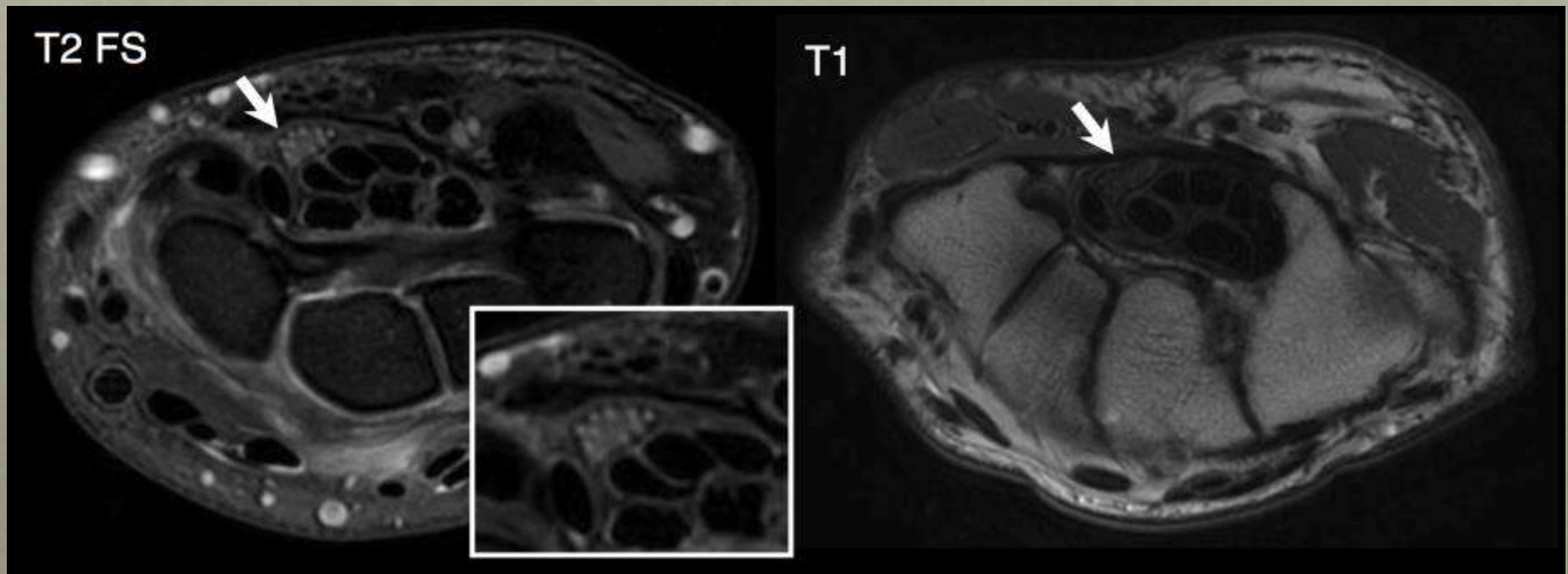
ECHOGRAPHIE

- Image Hypoéchogène hétérogène intraneurale + augmentation du diamètre du nerf (Walker Clin Neurophysiol 2004)
- Hypervascularisation intraneurale
- Détermine le niveau de la lésion



IRM

- T1 = exploration du diamètre du nerf
- T2 = Hyperdensité par anomalie du rapport graisse/eau
- Avec injection de Gadolinium, augmente la sensibilité de l'examen et montre des altérations infracliniques (KOBAYASHI J Orthop Sci 2009)



IRM VS EMG

- Sensibilité EMG sur nerf Ulnaire au coude: 69%
- Sensibilité de l'échographie: 96%
- Sensibilité de l'IRM: 92%
- Sensibilité de l'IRM sur les échecs de l'EMG: 84%

(Maertens de Noordhout Rev Neurol 2007)

CAS CLINIQUE

- Patiente 39 ans; section aileron rotulien sous ALR
- A 1 mois, paralysie complète du quadriceps
- EMG: Signe électrique en faveur d'une atteinte proximale du nerf fémoral.
- IRM: Hypersignal en T2 des différents chefs du quadriceps; Nerf fémoral: calibre normal sans névrome ni interruption du nerf. Pas de prise de contraste intra ou périneural après injection de gadolinium; absence de fibrose périneurale
- Echographie: calibre normal du nerf fémoral D et G sans névrome ni fibrose. Absence d'hyperhémie intra ou périneurale en mode doppler. Amyotrophie quadriceps gauche avec dégénérescence graisseuse intra musculaire

Iatrogenic femoral nerve injury: a systematic review

Abigail E. Moore · Mark D. Stringer

Surg Radiol Anat (2011) 33:649–658

studies. If there is no spontaneous recovery within 3 to 4 months, surgical exploration is necessary [19, 36]. Kretschmer et al. [38] present a detailed algorithm for the treatment of iatrogenic nerve lesions in which management was dictated by the mechanism of injury [38]. A clean transection requires primary repair either by end-to-end suture or grafting whilst a blunt transection demands early secondary repair [35, 38]. Contusion, compression, or traction injuries that fail to show adequate signs of recovery within about 3 months require surgical exploration and either repair, grafting or neurolysis [38]. Intraoperative evaluation of nerve action potentials across the injured segment can be useful in deciding whether to proceed to neurolysis or resection and grafting [36, 38]. No evidence of recovery 6 weeks after neurolysis indicates a need for resection and reconstruction [19]. In most cases of incomplete iatrogenic femoral neuropathy, i.e., contusion, compression, traction, or injection injuries, complete

PHYSIOPATHOLOGIE DE LA DOULEUR NEUROPATHIQUE

- Sensibilisation des nocicepteurs
- Hyperexcitabilité au niveau des plaques de démyélinisation
- Sensibilisation centrale (NMDA)
- Diminution de l'inhibition segmentaire (GABA)

BMJ

BMJ 2013;347:f7339 doi: 10.1136/bmj.f7339 (Published 19 December 2013)

Drugs for neuropathic pain

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NICE guidance for non-specialist settings emphasises the individualisation of treatment[1] but sets no specific pain relief goal. It recommends amitriptyline, gabapentin, duloxetine, or pregabalin as initial therapy for all neuropathic pain conditions except trigeminal neuralgia, with switching between them if pain relief is inadequate or drugs not tolerated. Treatments not to be used include cannabis, capsaicin patch, lacosamide, lamotrigine, levetiracetam, oxcarbazepine, topiramate, and venlafaxine.

What to do when monotherapy fails

Few studies have evaluated combination therapy. For patients who cannot tolerate high doses of a single agent, trying lower doses of two different agents with different adverse effect profiles is worthwhile. Multimodal therapy may give the best results, and drug treatment is often combined with advice to keep as active as possible and make other lifestyle changes. Psychological and physiotherapeutic interventions and stimulation therapies such as transcutaneous electrical nerve stimulation (TENS) are often combined with drug treatments. However, few studies have evaluated combining drug and non-drug therapies.

Titration of treatment

Titrate the dose to effect and tolerability, monitoring pain relief and adverse effects regularly. Patients often need encouragement to continue with medicines that may make them nauseous or dizzy initially but improve with time, as 2-4 weeks may be needed for effective pain relief. Titration may improve treatment adherence by minimising initial adverse effects and allows doses to be increased to the point where pain relief comes with tolerable adverse effects.

Titrate dose upwards carefully to minimise adverse effects.

Amitriptyline and nortriptyline—Start at 10-25 mg 2 hours before bedtime, increasing dose by 10-25 mg with a week's interval. The usual dose is 50-75 mg 2 hours before bedtime. Sometimes doses up 150 mg are needed.

Duloxetine—Start at 60 mg, although in elderly patients 30 mg is preferred.

Gabapentinoids—Start gabapentin at 300 mg or pregabalin at 75 mg in the evening. In elderly patients, the respective doses can be 100 mg and 25 mg. Pregabalin is administered twice daily, whereas gabapentin needs to be administered three times daily.

Treatment success is ≥50% reduction in pain intensity over 12 weeks with tolerable adverse events. Patients with chronic pain consider this to be a worthwhile benefit,[10 15] and pain reductions to this extent result in improvements in sleep, fatigue, depression, function, and quality of life.[16]

CONCLUSION

- Complication fréquente après une chirurgie
- Causes multiples et parfois intriquées
- Conséquences socio affectives parfois importantes
- Rester maitre de la prise en charge au sein d'un réseau de correspondants (électromyographiste-radiologue)
- Intérêt d'un bilan lésionnel complet et rapide