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**Synthèse et pistes de réflexions à
propos de 112 dossiers**

Quel est le risque de plainte après ALR ?

Cheney, FW: High-Severity Injuries Associated with Regional Anesthesia in the 1990s. ASA Newsletter 65(6): 6-8, 2001

- The ASA Closed Claims Project database consisted of **4.723 closed malpractice claims** retrieved from 35 insurance organizations that insured approximately **14.500 anesthesiologists**
- Of the total database, 67% (3.180) of the claims are associated with general anesthesia and **24%(1.133) are associated with the use of regional anesthesia.**
- Of claims where the injuries occurred in the 1990s, **death** occurred in 25% of those associated with general anesthesia and **10%** of those associated **with regional** anesthesia.
- Focusing on claims where the injury occurred in the 1990s, **claims associated with regional anesthesia are more likely to be of a lower severity** than those associated with general anesthesia

Injuries Associated with Regional Anesthesia in the 1980s and 1990s

Anesthesiology 2004; 101:143-52

A Closed Claims Analysis

Lori A. Lee, M.D.,* Karen L. Posner, Ph.D.,† Karan B. Domino, M.D., M.P.H.,‡ Robert A. Caplan, M.D.,§
Frederick W. Cheney, M.D.¶

Réclamations auprès de 35 compagnies d'assurance

5047 réclamations dont :

- 360 chronique et douleur postopératoire (exclues)
- 131 obstétrique mais uniquement l'enfant (exclues)
- 20% (1005) concernent l'ALR dont :

80 % (821) atteintes centrales

368 obs et 453 hors obstétrique

5 % (48) atteintes oculaires

10 % (134) blocs périphériques

Complications Associated With Eye Blocks and Peripheral Nerve Blocks: An American Society of Anesthesiologists Closed Claims Analysis

Lorri A. Lee, M.D., Karen L. Posner, Ph.D., Frederick W. Cheney, M.D., Robert A. Caplan, M.D., and Karen B. Domino, M.D., M.P.H.

Regional Anesthesia and Pain Medicine, Vol 33, No 5 (September–October), 2008; pp 416–422

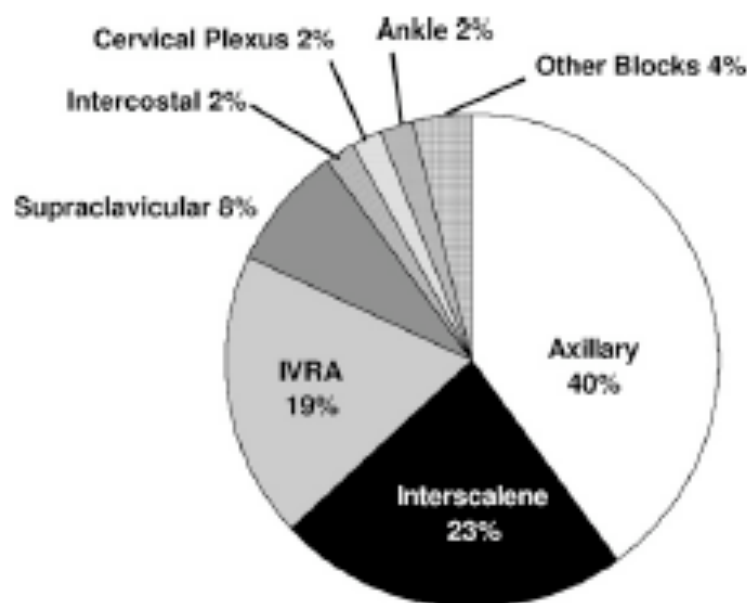


Table 4. Nerve Injuries Associated With Peripheral Nerve Block Claims (n = 159)

	Temporary Injury n (% of 48 claims)	Permanent Injury n (% of 48 claims)
Brachial plexus	15 (33)	21 (44)
Median nerve	16 (35)	12 (25)
Ulnar nerve	9 (20)	7 (15)
Radial nerve	4 (9)	2 (4)
Femoral nerve		1 (2)
Sciatic nerve		2 (4)
Epidural/spinal		5 (10)
Phrenic	1 (2)	2 (4)
Other*	3 (7)	3 (6)

Complications Associated With Eye Blocks and Peripheral Nerve Blocks: An American Society of Anesthesiologists Closed Claims Analysis

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Table 5. Type of Block Associated With Most Common Complications for Peripheral Nerve Block Claims

	Temporary Nerve Injury (n = 46) (n, % of 46)	Permanent Nerve Injury (n = 48) (n, % of 48)	Pneumothorax (n = 16) (n, % of 16)	Death/Brain Damage (n = 19) (n, % of 19)
Axillary	27 (59)	25 (52)	2 (13)	4 (21)
Interscalene	9 (20)	13 (27)	6 (38)	7 (37)
Intravascular	7 (15)	2 (4)	0	3 (16)
Regional				
Suprascapular	1 (2)	4 (8)	7 (44)	1 (5)
Other	2 (4)	4 (8)	1 (6)	4 (21)

Neurological Complications After Regional Anesthesia: Contemporary Estimates of Risk

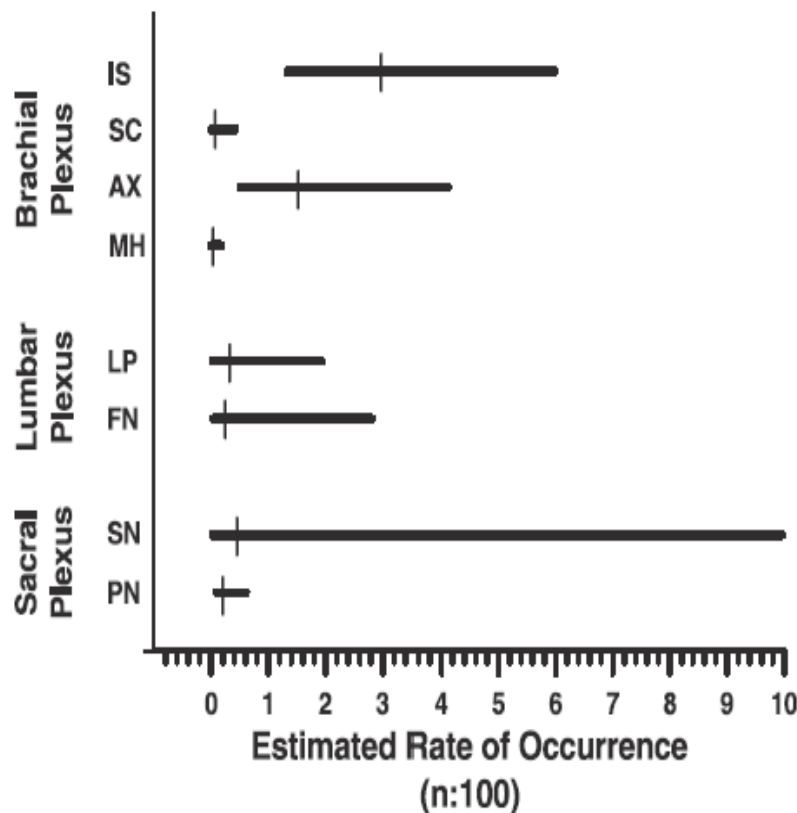
Anesth Analg 2007;104:965-74

Richard Brull, MD, FRCPC

Colin J. L. McCartney, MBChB,
FRCA, FFARCSI, FRCPC

Vincent W. S. Chan, MD, FRCPC

Hossam El-Beheiry, MBBCh, PhD,
FRCPC



CONCLUSIONS: Our review suggests that the rate of neurological complications after central nerve blockade is $<4:10,000$, or 0.04%. The rate of neuropathy after PNB is $<3:100$, or 3%. However, permanent neurological injury after RA is rare in contemporary anesthetic practice.

The limit of US: resolution = 1mm

Incidence and Effects of Unintentional Intraneural Injection During Ultrasound-Guided Subgluteal Sciatic Nerve Block

(Reg Anesth Pain Med 2012;

Kaoru Hara, MD, Shinichi Sakura, MD, Naomi Yokokawa, MD, and Saki Tadenuma, MD

Conclusions: Unintentional intraneural injection occurred at an incidence rate of 16.3% for the ultrasound-guided subgluteal approach to the sciatic nerve. Intraneural injection of mepivacaine or ropivacaine hastened the onset of blockade but did not affect block duration, and it did not result in clinical neural injury in our small sample of patients.

Incidence of unintentional intraneural injection and postoperative neurological complications with ultrasound-guided interscalene and supraclavicular nerve blocks*

Anaesthesia, 2011, 66, pages 168-174

S. S. Liu,¹ J. T. YaDeau,² P. M. Shaw,³ S. Wilfred,⁴ T. Shetty⁵ and M. Gordon⁶

It is proposed that ultrasound guidance decreases the risk of intraneural injection and associated postoperative neurological complications. However, the incidence of unintentional intraneural injection with ultrasound is unknown. Two hundred and fifty-seven patients were enrolled in a prospective, single-blind observational study. All patients underwent a pre-operative neurological examination before ambulatory shoulder arthroscopy with sedation and ultrasound-guided interscalene or supraclavicular block. Patients were followed up at 1 week and at 4-6 weeks postoperatively. Two blinded anaesthesiologists viewed the same video of the ultrasound image during the block offline to determine intraneural trespass. Intraneural injection occurred in 42 patients (17%; 95% CI 12-22%). No patient suffered from postoperative neurological complications (0%; 95% CI 0-1.6%) at follow-up.

Preliminary Results of the Australasian Regional Anaesthesia Collaboration

Reg Anesth Pain Med 2009;34: 534-541

A Prospective Audit of More Than 7000 Peripheral Nerve and Plexus Blocks for Neurologic and Other Complications

Michael J. Barrington, MB, BS, FANZCA,* Steve A. Watts, MB, ChB, FANZCA,†
 Samuel R. Gledhill, MMedStat,* Rowan D. Thomas, MB, BS, FANZCA, MPH,* Simone A. Said, PGDipEpi,*
 Gabriel L. Snyder, MB, BS,* Valerie S. Tay, MB, BS, FRACP,‡ and Konrad Jamrozik, DPhil, FAFPHM§

TABLE 5. Immediate and Delayed Complications According to Nerve Localization Technique

Complication	Nerve Localization Technique			Total (n = 8189)
	Nerve Stimulation (n = 2507)	Ultrasound (n = 5141)	Other (n = 541)	
Local anesthetic toxicity	1.2 (0.25–3.5)	0.8 (0.2–2.0)*	1.8 (0.05–10.3)	0.98 (0.42–1.9)
Unintentional vascular puncture†	13.9 (8.2–21.9)	5.1 (3.0–8.1)‡	2.3 (0.06–12.8)	7.2 (5.1–10.0)
Unintended paresthesia†	10.8 (5.9–18.1)	20.5 (15.9–25.9)*	2.3 (0.06–12.8)	16.8 (13.4–20.8)
Late neurologic deficit	0.8 (0.1–2.9)	0.2 (0.005–1.1)*	—	0.4 (0.08–1.1)
Long-term neurologic deficit	0.4 (0.01–2.2)	0.2 (0.05–1.1)*	—	0.2 (0.03–0.9)

Data are presented as n/1000 (95% CI) procedures.

Ultrasound includes ultrasound used as the sole technology and combined ultrasound and nerve stimulation. *Other* comprises techniques not using nerve stimulation or ultrasound technology.

*Not statistically significant.

†Reduced total cohort (n = 4991), for nerve stimulation (n = 1297), ultrasound (n = 3260), and other (n = 434).

‡Indicates a statistically significant difference ($P = 0.001$; Poisson regression) between ultrasound and nerve stimulation and other techniques.

Permanent complications after peripheral nerve/plexus blockade are uncommon
 The origin of neurologic symptoms/signs in the perioperative period is most likely unrelated to PNB.

Despite changes in technique over the last decade, the reported incidence of nerve injury related to PNB has not changed.



Claims after anesthesia (2001-2011)



GAMM insurance compagny In France

- 11 years - 2350 claims – 1500 Anesthetists

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	
4700	4819	4843	5121	5117	5143	5041	4945	4873	4841	4798		anesthetists
232	218	175	209	207	222	239	250	199	200	198	2349	DECLARATIONS
72	67	67	75	83	91	85	91	65	75	62	833	teeth
20	24	22	26	32	26	25	27	35	22	22	281	GA
37	34	22	40	34	39	45	51	50	48	51	451	POST OP
4	4		3	4	9	4	6		4		38	POSITION
30	28	17	27	22	23	34	32	22	22	27	284	RA
11	7	8	7	6	6	10	11	4	6	7	83	spinal
6	9	4	3	7	6	5	4	6	7	4	61	epidural
9	5	4	15	6	10	15	15	9	5	13	106	PNB
7	5	10	13	6	18	17	13	7	11	8	115	studied
0	0	0	0	0	0	1	2	4	7	8	22	US

- 22 claim with Ultrasound: 13 US+NS - 9 US
- in which 15 related to PNB : **the guilty part**

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§*

Reg Anesth Pain Med 2015;40: 479–490

Nerve localization techniques

- There are no human data to support the superiority of one nerve localization technique over another with regard to reducing the likelihood of PNI.^{99,127,137} (Class I)
- Presence of an evoked motor response at a current of <0.5 (0.1 ms) indicates intimate needle-nerve relationship, needle-nerve contact, or an intraneural needle placement.^{59,60,104,113} (Class I)
- Absence of a motor response at current of up to 1.8 mA does not exclude needle-nerve contact or intraneural needle placement.^{103,104} (Class I)
- Animal data have linked high injection pressures to subsequent fascicular injury, but there are no human data that confirm or refute the effectiveness of injection pressure monitoring for limiting PNI.^{18,109} (Class II)
- Injection pressure monitoring can detect needle-nerve contact for interscalene brachial plexus block.¹²¹ (Class I)
- The common practice of subjectively assessing injection pressure by “hand feel” is inaccurate.¹¹⁸ (Class I)
- Ultrasound can detect intraneural injection.^{105,110} (Class I)
- Current ultrasound technology does not have adequate resolution to discern between an interfascicular and intrafascicular injection.^{104,110,138} (Class I)
- Adequate images of needle-nerve interface are not consistently obtained by all operators and in all patients.^{57,128} (Class I)

Neuropathies : Regional anaesthesia or other causes?

Surgery	Attempt	Incidence (%)
Total hip arthroplasty	Sciatic nerve	2 – 4 %
Total knee arthroplasty	Fibular nerve	1 – 6 %
Shoulder arthroplasty	Brachial plexus	3 %
Humerus fracture	Radial nerve	18 %
Shoulder's arthroscopy	Axillary nerve	4 %
Elbow arthroplasty	Ulnar nerve	16 %

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

Anesth Analg 2006;102:990-5

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

Table 3. Patient Characteristics Potentially Associated with Peroneal or Tibial Palsy

Characteristic	N*	Palsy n (%)	P value†
Age (yr)			<0.001
≤64	361	45 (12)	
65-75	570	30 (5)	
≥76	235	15 (6)	
Gender			0.946
Male	587	45 (8)	
Female	579	45 (8)	
Preoperative systolic blood pressure (mm Hg)			0.008
≤134	441	42 (10)	
135-150	413	28 (7)	
≥151	335	20 (6)	
Diabetes			0.700
No	1035	81 (8)	
Yes	131	9 (7)	
Any preexisting neurological condition			0.376
No	955	70 (7)	
Yes	208	19 (9)	

Table 4. Procedural Characteristics Potentially Associated with Peroneal or Tibial Palsy

Characteristic	N*	Palsy n (%)	P value†
Surgical procedure			0.005
Unilateral primary arthroplasty	517	26 (5)	
Unilateral revision arthroplasty	303	34 (11)	
Bilateral primary or revision arthroplasty	341	30 (9)	
Surgical duration (min)			<0.001
≤179	232	4 (2)	
180-209	340	13 (4)	
210-239	224	17 (8)	
≥240	369	56 (15)	
Total tourniquet time (min)			<0.001
120-134	509	12 (2)	
135-149	319	13 (4)	
150-179	222	26 (12)	
≥180	116	39 (34)	
Longest tourniquet interval without deflation (min)			0.001
120-134	763	47 (6)	
135-149	286	21 (7)	
150-179	74	8 (11)	
≥180	30	13 (43)	

Le conflit pratiquant / expert

RUBRIQUE MÉDICOLÉGALE COMMENTÉE : CELA N'ARRIVE PAS QU'AUX AUTRES...
Annales Françaises d'Anesthésie et de Réanimation xxx (2008)

Neuropathie résiduelle après un bloc du nerf sciatique pour ostéotomie tibiale

J.-M. Desmots

Lettre à la rédaction

À propos d'une neuropathie...

L. Delaunay^{a,*}
P. Catoire^b
J.-P. Estèbe^c
M. Gentili^d

Neuropathie résiduelle après un bloc du nerf sciatique :

réponse à la lettre de Delaunay et al.

J.-M. Desmots,

Les recommandations Nord-Américaines

Le patient diabétique

ASRA Practice Advisory on Neurologic Complications in Regional Anesthesia and Pain Medicine

Joseph M. Neal, M.D., Christopher M. Bernard, M.D., Admir Hadzic, M.D.,
James R. Hebl, M.D., Quinn H. Hogan, M.D., Terese T. Horlocker, M.D.,
Lorri A. Lee, M.D., James P. Rathmell, M.D., Eric J. Sorenson, M.D.,
Santhanam Suresh, M.D., and Denise J. Wedel, M.D.

Reg Anesth Pain Med 2008;33:404-415.

“Pre-existing peripheral neuropathy

- **Patients with chronic diabetes mellitus**, severe peripheral vascular disease, multiple sclerosis, or previous exposure to chemotherapy (e.g., cisplatin or vincristine) may have clinical or subclinical evidence of a pre-existing peripheral neuropathy.

Peripheral nerve block may theoretically increase the risk of new or progressive postoperative neurologic complications in these patients.

However, existing data can neither confirm nor refute this theory in clinical practice. Under these clinical conditions, a careful risk-to-benefit assessment of regional anesthesia to alternative perioperative anesthesia and analgesia techniques should be considered. (Class II)”

Techniques

- Cathéter (S/F/Ax/IS/SC) 15(5/4/3/2/1)
- Interscalénique 15
- Huméral – axillaire 10
- Sciatique 10
- Fémoral 8
- Blbloc F S (O) 6
- Supraclaviculaire 4
- Infraclaviculaire 2
- Lombaire / poignet ... 1/1

Dommmages : Neuropathies

- Plexus brachial 9
IS : 7 – SC : 1 – IC : 1
- Fémoral 8
- Sciatique 7
- Fibulaire commmun 6
- Tronculaire MS 7
M : 4 – M + U : 1 – R : 1 – U : 1
- Phrénique 1

Autres dommages

- Toxicité systémique 3
- Rachianesthésie totale 1
- Infection 1
- Hématomes 4
- PNO 5
SC : 3 – IC : 1 – IS : 1
- Douleurs locales 3
- Erreurs de coté 3

Autres dommages

- Neuropathies positionnelles 7
Peropératoires : 3 (plexique 2 – ulnaire 1)
Postopératoires : 4
- Syndrome de loges masqué 2

Constats des experts

- États antérieurs méconnus 7
 - Neuropathie axonale
 - Poliomyélite
 - Canal lombaire étroit
 - Canal cervical étroit
 - Entorse cervicale (n. thoracique long...)
 - SLA
 - connectivite
- Décompensation syndrome canalaire 2
- Cause “multivalente” probable 12
 - Chirurgie – position – garrot – ponction ...

Constat des experts

- Imputabilité erronée 8
- SRDC 7
- Simulation – conversion 4
- US : 3 dossiers (2 neuropathies – 1 positionnelle)
- Dose anesthésique pour une analgésie
- Difficulté lecture analyse EMG
- Dossiers « fantômes »: anesthésie & analgésie
- Conséquences professionnelles
musicien, menuisier, sportif...
- Suivi exclusif du patient par le chirurgien

Principaux manquements

- **Défaut d'information sur les risques de l'ALR** **48**
 - absence ou insuffisance d'information / risques particuliers 28
 - information du patient absente ou erronée 10
 - absence de consentement éclairé 8
 - consentement tardif sur la table d'opération, obtenu après prémédication ou sédation 2
- **Défaut d'information sur les alternatives** **32**
 - prise de risque injustifié (alternative moins risquée) 8
 - technique imposée sans alternative 8
 - choix technique inadapté 6
 - rapport bénéfice risque défavorable 4
 - sous évaluation du risque lié à la réalisation de l'ALR 3
 - Changement de stratégie entre consultant et pratiquant 2

Principaux manquements

- **Défaut de réalisation technique** **15**
 - non respect des recommandations 6
 - non respect des règles de sécurité 6
 - non respect des contre indications 1
 - délégation de la technique (IADE, médecin en formation) 1
 - manque d'expérience de l'ALR 1
- **Défaut de surveillance postopératoire** **22**
 - retard de diagnostic de la complication 13
 - surveillance défectueuse 9

Prises de risque

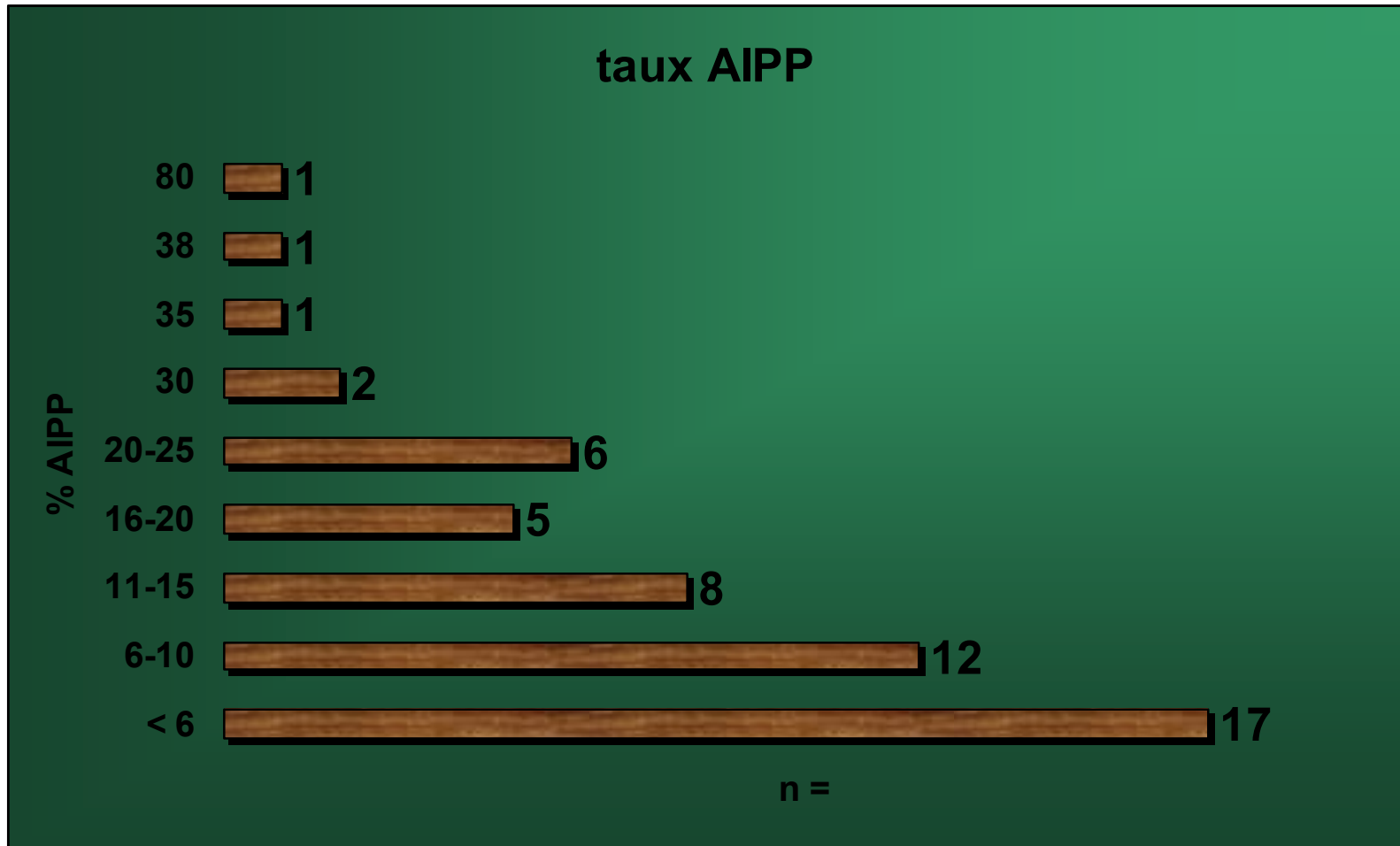
- **Chirurgie à risque** **20**
 - Bloc proche chirurgie et garrot 18
 - Bloc sciatique et syndrome de loge 2
- **Terrain à risque** **19**
 - Neurologique 10
 - Diabétique 5
 - Profession 3
 - Septique 1
 - Cardiaque 1

Prises de risque

- **Technique à risque** **4**
 - Dose importante d'anesthésique 3
 - Durée excessive cathétérisme 1

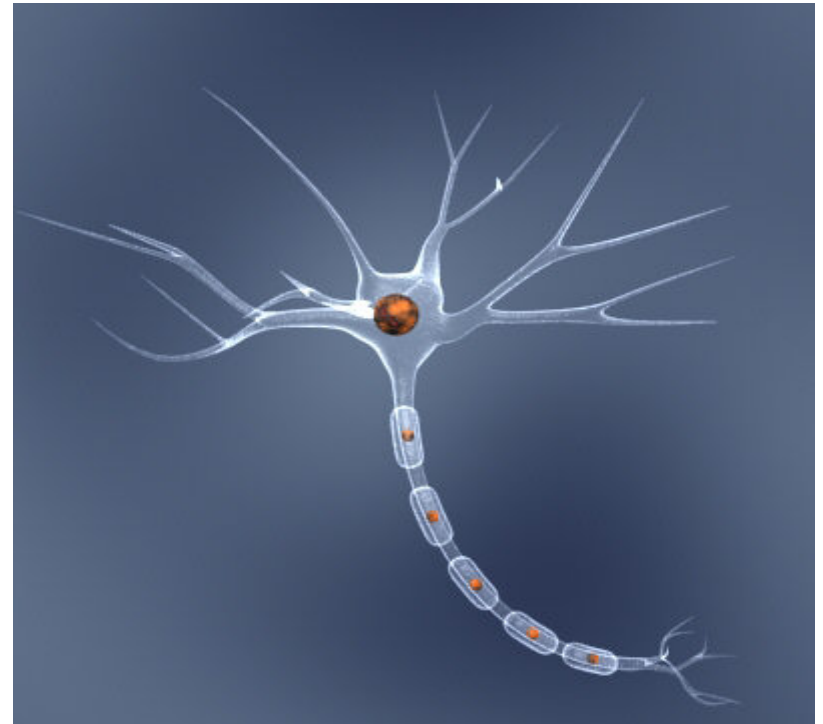
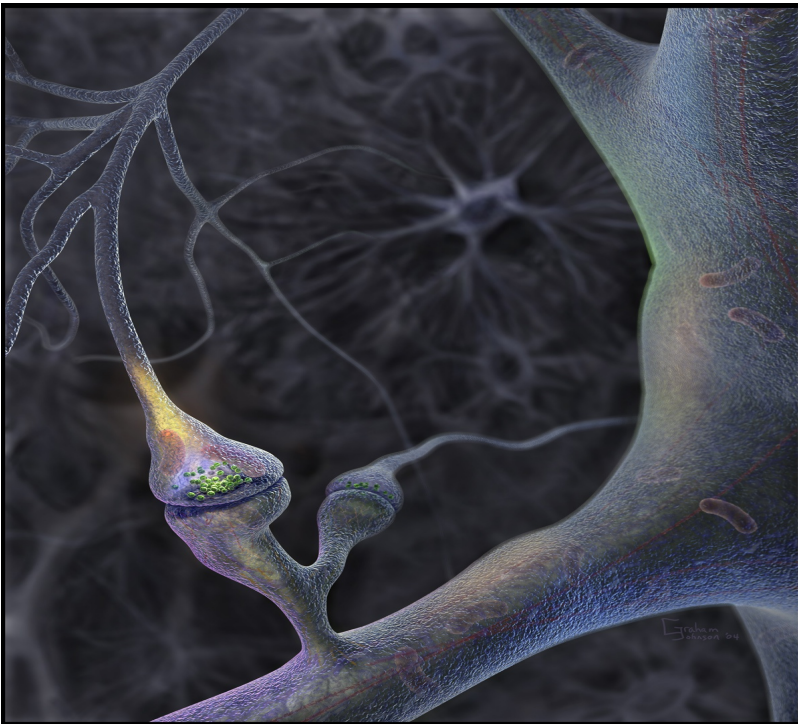
- **Comportements à risque** **30**
 - Absence de tracabilité 12
 - Recommandations non suivies 4
 - Réalisation inadaptée (Injection rapide) 3
 - Vérification imparfaite du bloc 4
 - Défaut de surveillance postopératoire 1
 - Erreur de côté 3
 - Mauvaise relation patient anesth chir 3

L' indemnisation - n = 53



Risque Neurologique

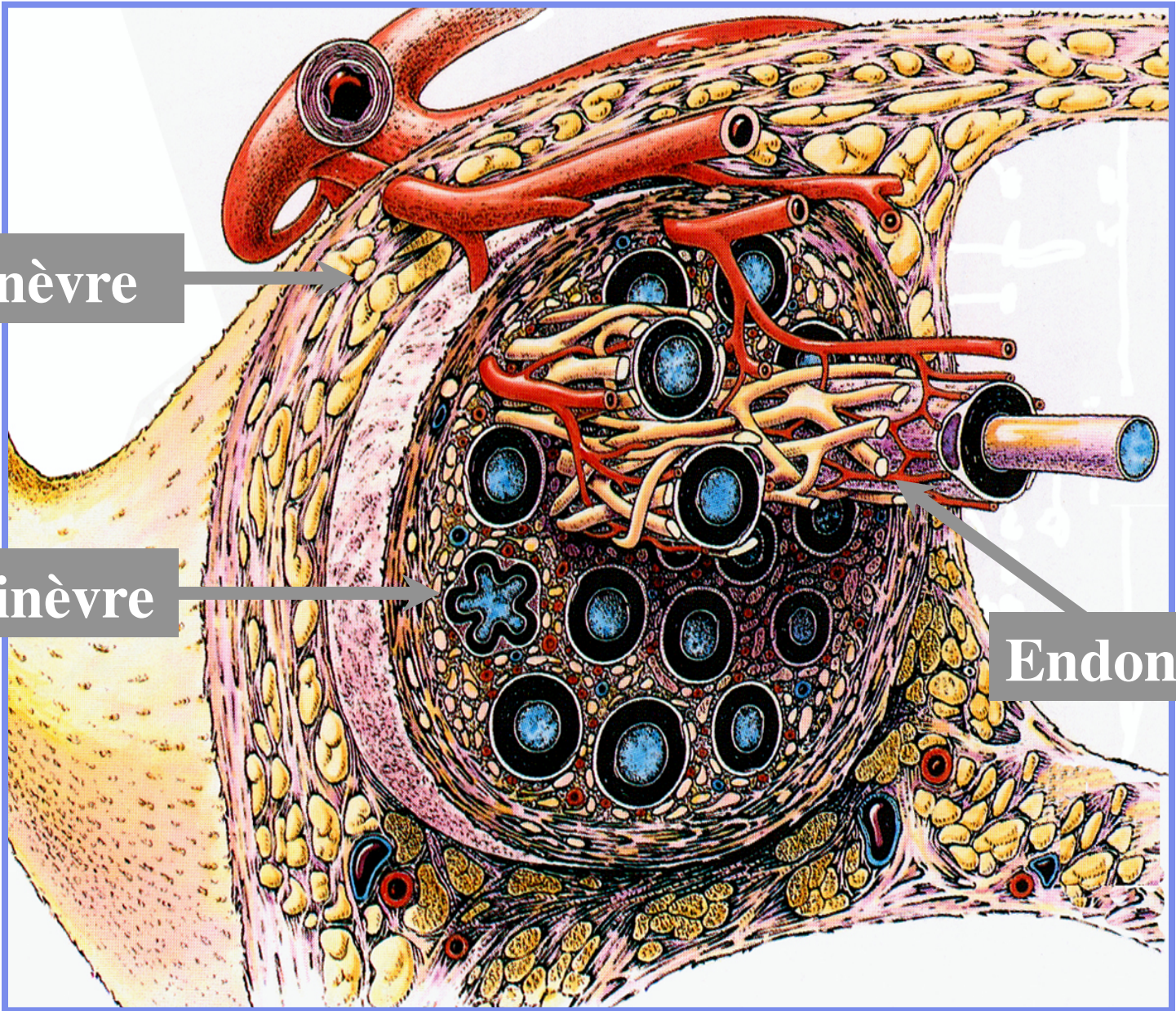
- Risque lié aux Anesthésiques Locaux
- Risque lié à la compression fasciculaire (ischémie)
- Risque lié à l'aiguille
- Risque lié au patient



Epinèvre

Périnèvre

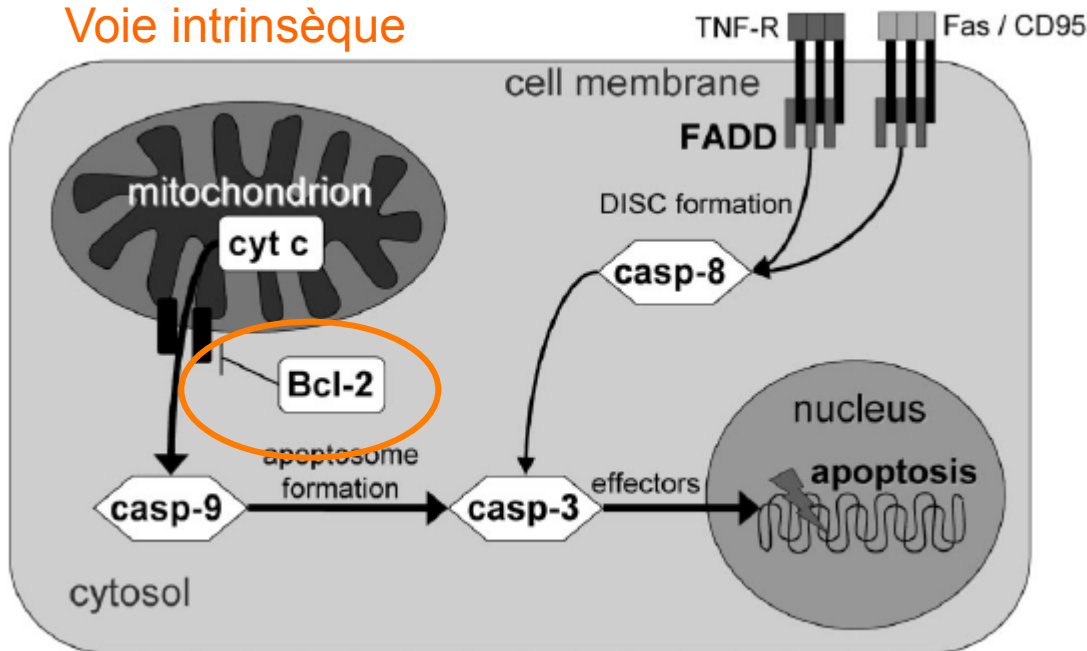
Endonèvre



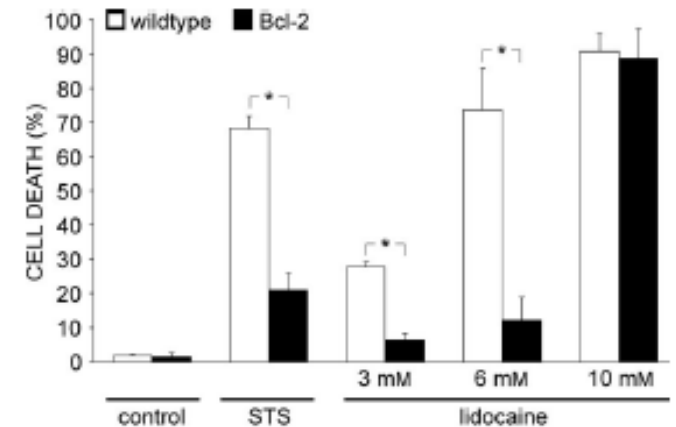
Lidocaine Induces Apoptosis via the Mitochondrial Pathway Independently of Death Receptor Signaling

Anesthesiology 2007; 107:136–43

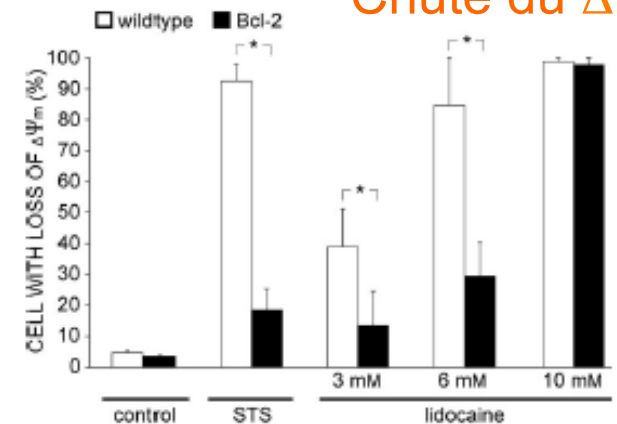
Voie intrinsèque



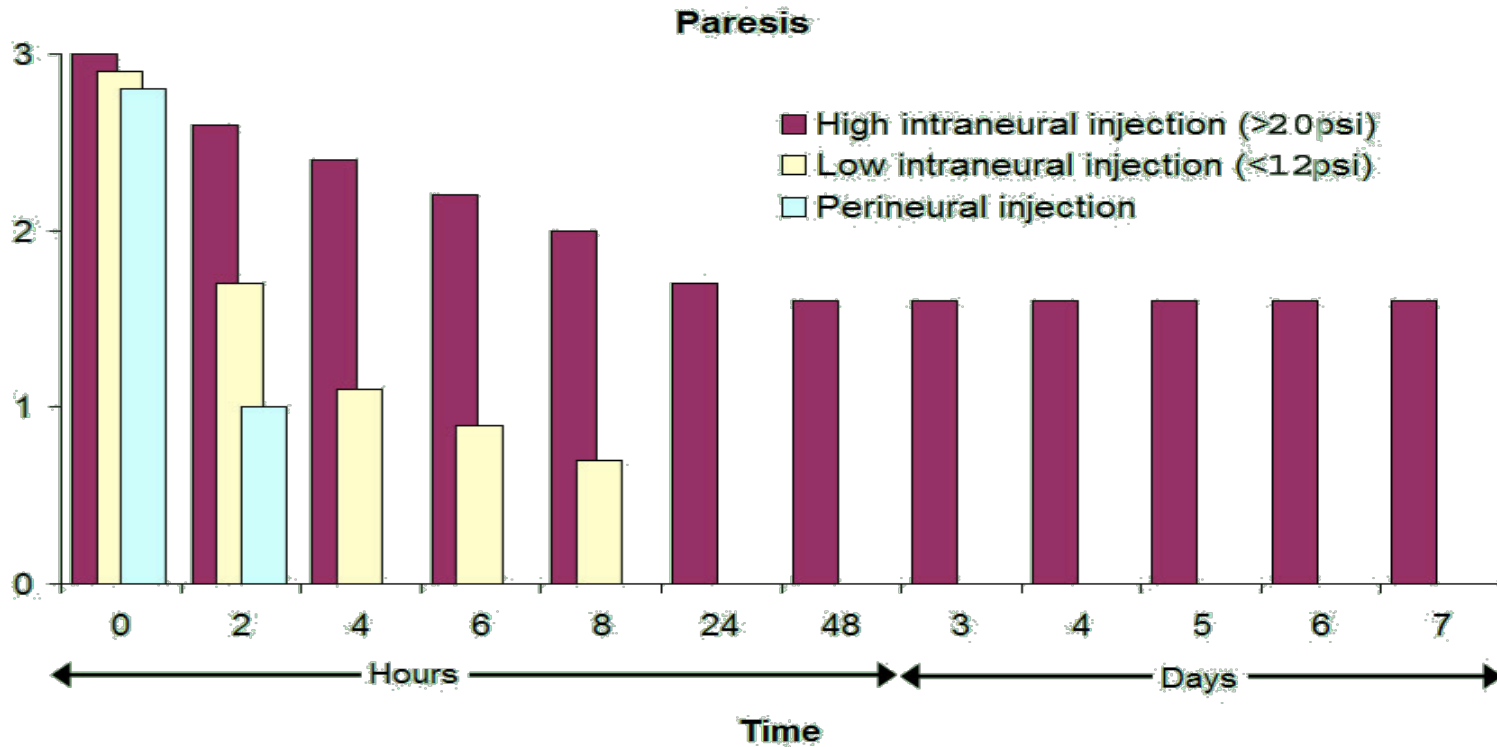
Mort cellulaire



Chute du $\Delta\Psi$



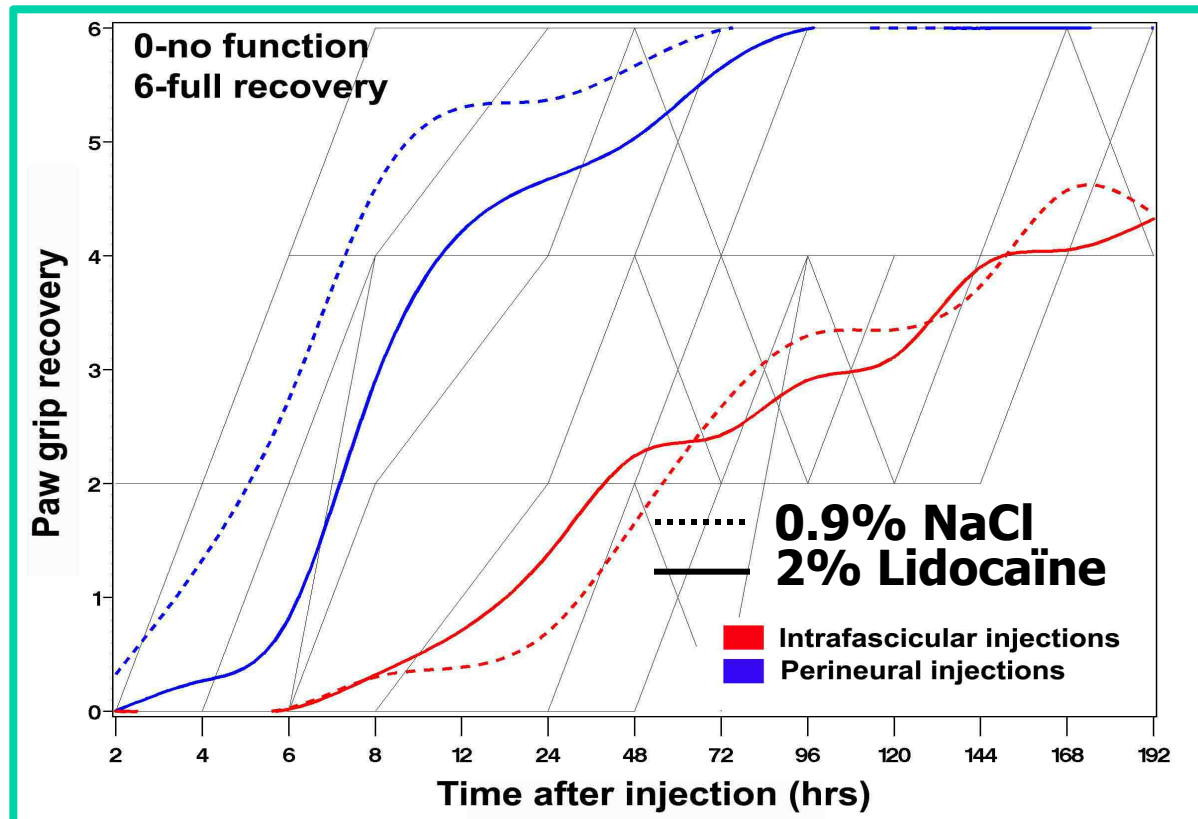
Mesurons les pressions d'injection !



- C'est la surveillance du niveau de pression d'injection des AL qui est l'élément déterminant

Injection intraneurale et lésion nerveuse

C'est la pression qui est responsable de la lésion, pas l'anesthésique local

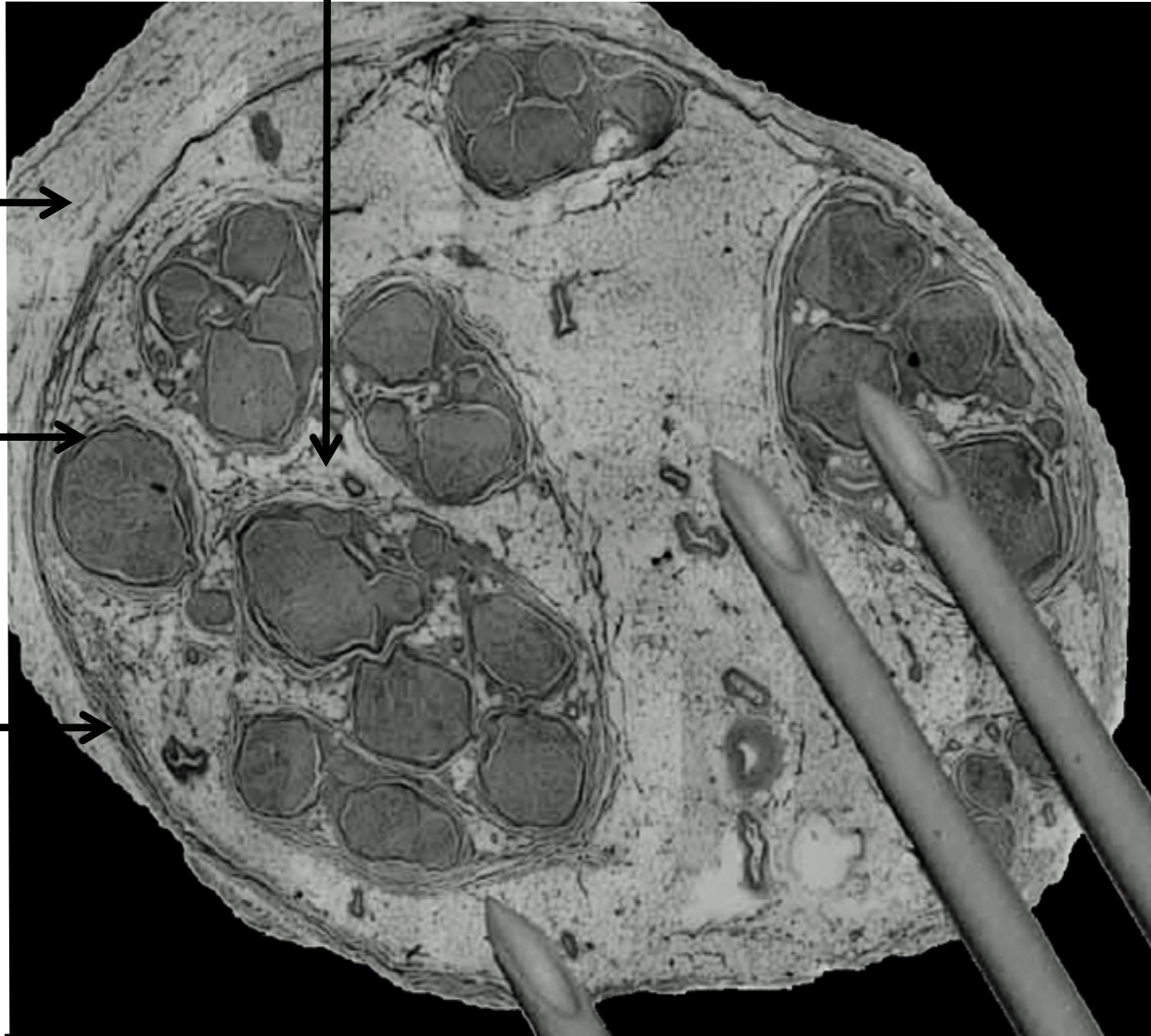


Epinèvre
interfasciculaire

Paranèvre

Périnèvre

Epinèvre
extrafasciculaire

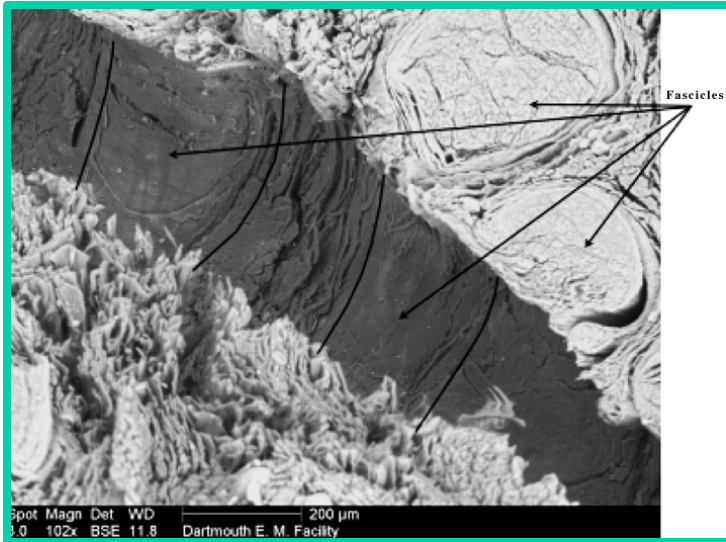


Electron microscopy evaluation of block needle-related trauma to the tibial nerve

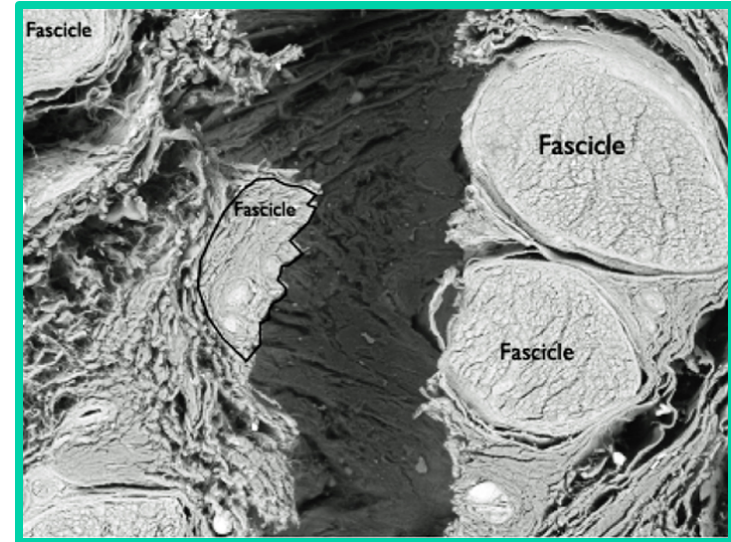
Acta Anaesthesiol Scand 2010

K. S. MACDONALD and B. D. SITES

The Department of Anesthesiology, Dartmouth-Hitchcock Medical Center, Lebanon, NH



Biseau court



Biseau long

Results: The epineurium, perineurium, fascicles, endoneurium, and vessels were identified in each sample. In both the short-beveled and the Whitacre samples, all fascicles along with the surrounding perineurium were intact. In both the Tuohy and the Quincke samples, obvious transection of fascicles and disruption of the perineurium were observed.