Societat Catalana d'Anestesiologia, Reanimació i Terapèutica del Dolor

01-04-2019 | 19:30 - 22:00 | Sala 8

19:30 - 21:30 **Dolor derivat de les complicacions neurològiques de l'anestèsia regional** (Sessió)
Moderador/a: Dr. Luis Lorente Caparros. *Hospital Universitari General de Catalunya, Sant Cugat del Vallès*

- Revisió de las complicacions neurològiques en anestèsia locoregional i dolor
  Ponent: Dra. Marta Ferrándiz Mach. *Hospital de la Santa Creu i Sant Pau, Barcelona*
- Neuropatia post bloqueig, prevenir és millor que curar
  Ponent: Dr. Xavier Sala Blanch. *Hospital Clínic, Barcelona*
- Malposicions quirúrgiques i lesions nervioses
  Ponent: Dr. Jose Antonio Fernández Núñez. *Hospital de la Santa Creu i Sant Pau, Barcelona*

Neuropatia post-bloqueig: Prevenir és millor que tractar.

Xavier Sala-Blanch

X	No, nothing to disclose
	Yes, please specify:

Faculty Disclosure

Company Name	*Honoraria/ Expenses*	*Consulting/ Advisory Board*	*Funded Research*	*Royalties/ Patent*	*Stock Options*	*Ownership/ Equity Position*	*Employee*	*Other (please specify)*

Ultrasound Guidance Speeds Execution and Improves the Quality of Supraclavicular Block

Stephan R. Williams, MD, PhD*, Philippe Chouinard, MD, FRCPC*, Geneviève Arcand, MD*, Patrick Harris, MD, FRCSC†, Monique Ruel, RN*, Daniel Boudreault, MD, FRCPC*, and François Girard, MD, FRCPC*

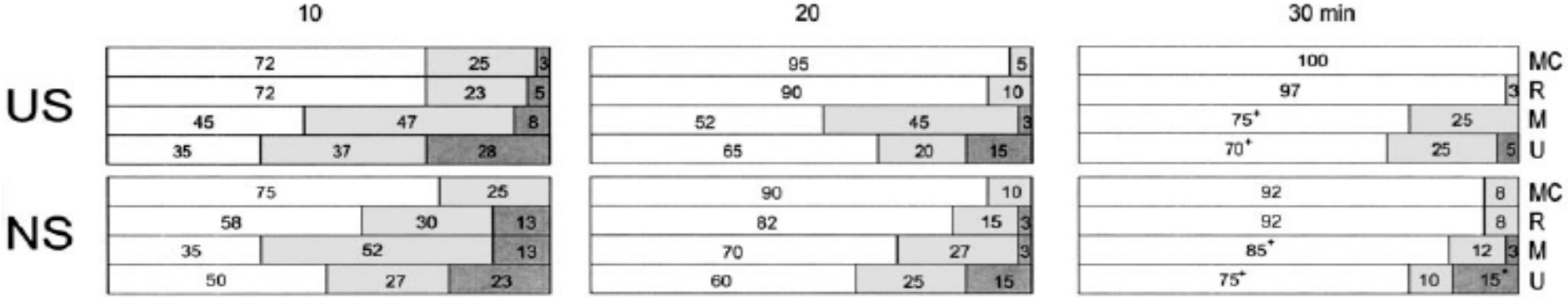

Table 1. Block Success as a Function of Localization Technique

	Group US	Group NS	*P* value
Surgical block	85 (70–94)	78 (62–89)	0.28
Supplementation	15 (6–30)	23 (11–38)	
General anesthesia	0 (0–9)	8 (2–20)	0.12

The use of newer imaging techniques has been described as "critically important to the future" of regional anesthesia (20); the future of ultrasound-guided blocks will depend in part on whether or not the clinical benefits associated with imaging technology justify equipment acquisition costs. The present study shows that the theoretical advantages of ultrasound localization translate into clinically useful benefits. We conclude that ultrasound-guided neurostimulator-confirmed supraclavicular block is more rapidly performed and provides a more complete block than supraclavicular block using only anatomic landmarks and neurostimulator confirmation.

Eficacia

Societat Catalana d'Anestesiologia, Reanimació i Terapèutica del Dolor

Anesthesiology 2001; 95:875–80

Acute and Nonacute Complications Associated with Interscalene Block and Shoulder Surgery

A Prospective Study

Alain Borgeat, M.D., Georgios Ekatodramis, M.D.,† Fabian Kalberer, M.D.,‡ Cedric Benz, M.D.§*

Conclusions: **Interscalene brachial plexus block performed with a standardized technical approach, material, and drugs is associated with an incidence of short- and severe long-term complications of 0.4%. In case of persistent paresthesia, dyses-**

The Maximum Effective Needle-to-Nerve Distance for Ultrasound-Guided Interscalene Block

An Exploratory Study

Eric Albrecht, MD, DESA, Kyle R. Kirkham, MD, FRCPC,* Patrick Taffé, PhD,† Ryan V.W. Endersby, MD, FRCPC,* Vincent W.S. Chan, MD, FRCPC,* Cyrus Tse, BSc,* and Richard Brull, MD, FRCPC**

Seguridad

Neurological Complications After Regional Anesthesia: Contemporary Estimates of Risk

Brull R, McCartney CJ, Chan VW, El-Beheiry H.

METHODS: We reviewed all 32 studies published between January 1, 1995 and December 31, 2005 where the primary intent was to investigate neurological complications of RA.

Table 4. Aggregate Estimated Rate of Occurrence of Neuropathy After Peripheral Nerve Blockade

	Estimated rate of occurrence ($n = 100$)	Lower CI ($n = 100$)	Upper CI ($n = 100$)	Heterogeneity (Q value)	
Brachial plexus blockade					
Interscalene block (7 studies)	2.84	1.33	5.98	90.71	$P < 0.01$
Supraclavicular block (1 study)	0.03	0.00	0.42	NA	NA
Axillary block (10 studies)	1.48	0.52	4.11	315.57	$P < 0.01$
Midhumeral block (2 studies)	0.02	0.00	0.09	0.28	NS
Lumbar plexus blockade					
Lumbar plexus block (3 studies)	0.19	0.02	1.93	6.18	$P < 0.05$
Femoral nerve block (4 studies)	0.34	0.04	2.81	57.51	$P < 0.01$
Sacral plexus blockade					
Sciatic nerve block (3 studies)	0.41	0.02	9.96	38.71	$P < 0.01$
Popliteal nerve block (4 studies)	0.24	0.10	0.61	0.96	NS

The estimated rate of occurrence was calculated using a random effects general linear model (see text).

CI = 95% confidence interval; NA = not applicable; NS = nonsignificant (nonsignificance indicates the absence of heterogeneity between studies).

Preliminary Results of the Australasian Regional Anaesthesia Collaboration

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§*

(*Reg Anesth Pain Med* 2009;34: 534–541)

TABLE 1. Block Type, Success Rate, and Timing of Follow-Up at Each Hospital

Hospital	ISB	PCB	AXB	UL	Trunk	FNB	LP	SCI	LL	Other	Total	Success, %	7–10 d/6 wk/Total Follow-Up, %
A	13	18	16	3	30	38	0	14	2	0	134	93	49/28/78
B	79	7	52	5	31	58	0	27	2	0	261	95	21/58/79
C	21	10	1	4	44	84	0	13	0	0	177	94	16/54/70
D	31	15	12	3	270	76	0	27	2	1	437	89	41/45/86
E	15	7	3	0	3	60	29	68	1	1	187	99	66/15/81
F	31	16	17	3	37	95	12	54	6	3	274	97	12/57/69
G	476	242	81	0	67	1061	645	565	0	61	3198	86	90/0/90
H	207	167	1039	189	183	890	5	505	64	30	3279	89	31/61/92
I	16	17	30	4	46	101	0	12	6	10	242	96	0/46/46
Total	889	499	1251	211	711	2463	691	1285	83	106	8189	89	53/34/87

Data are presented as n (number of blocks) or percentage (%). Success was defined as block with successful puncture and injection of local anesthetic with development of anticipated block characteristics including evidence of sensory or motor block. Six-week follow-up or 7- to 10-day follow-up refers to patients successfully followed up at these time periods. Total percentage may not equal 100 due to rounding.

ISB indicates interscalene block; PCB, periclavicular block; AXB, axillary brachial plexus block; UL, distal upper limb block; FNB, femoral nerve or fascia iliaca block; LP, posterior lumbar plexus block; SCI, sciatic nerve block; LL, distal lower limb block.

Preliminary Results of the Australasian Regional Anaesthesia Collaboration

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

(*Reg Anesth Pain Med* 2009;34: 534–541)

	Nerve Localization Technique			
Complication	**Nerve Stimulation (n = 2507)**	**Ultrasound (n = 5141)**	**Other (n = 541)**	**Total (n = 8189)**
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)

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Anaesthesia, 2009, **64**, pages 836–844 doi:10.1111/j.1365-2044.2009.

Neurological complication analysis of 1000 ultrasound guided peripheral nerve blocks for elective orthopaedic surgery: a prospective study*

M. J. Fredrickson[1] and D. H. Kilfoyle[2]

Block	*n*	Needle alignment	Concomitant NS	Local anaesthetic	Perineural catheter	Surgery	Block success
Interscalene	659	OOP	68%	30–40 ml lidocaine 2% / ropivacaine 0.5% or 30 ml ropivacaine 0.5%	98%	RCR Stabilisation other	95%
Supraclavicular	32	IP	7%	25–30 ml lidocaine 2% (adrenaline 1/200 000)	0	Hand/wrist	81%
Infraclavicular	122	IP	4%	25–30 ml lidocaine 2% (adrenaline 1/200 000)	4%	Hand/wrist elbow	97%
Femoral	99	OOP	23%	30 ml ropivacaine 0.5%	77%	ACLR TKJR arthroscopy	97%
Sciatic	98	IP (69%) OOP (31%)	29%	20–30 ml ropivacaine 0.5%	12%	Foot/ankle ACLR TKJR	87%
Overall	1010	IP (23%) OOP (77%)	48%		72%		95%

NS, nerve stimulation; RCR, rotator cuff repair; ACLR, anterior cruciate ligament reconstruction; TKJR, total knee joint replacement; OOP, out-of-plane; IP, in-plane.

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Anaesthesia, 2009, **64**, pages 836–844 doi:10.1111/j.1365-2044.2009.

Neurological complication analysis of 1000 ultrasound guided peripheral nerve blocks for elective orthopaedic surgery: a prospective study*

M. J. Fredrickson[1] and D. H. Kilfoyle[2]

Table 4 Neurological symptoms according to block/surgical technique. Values are *n* (*n*%) unless stated.

Block/surgical parameter	*n*	Neurological complication odds ratio	p-Value
Block under GA	32 (3.2%)	1.11	0.747
OOP needle-probe alignment	774 (77%)	1.11	0.547
Concomitant NS	478 (48%)	0.82	0.132
Paraesthesia during procedure	55/452 (12%)*	1.69	0.029
Tourniquet time > 45 min	96 (9.6%)	0.72	0.294
Perineural catheter inserted	721 (72%)	1.11	0.567
Repeat block	45 (4.5%)	1.11	0.737

GA, general anaesthesia; OOP, out-of-plane; NS, nerve stimulation.
*452 subjects were specifically questioned for the presence or absence of paraesthesia (defined as an electric shock-like sensation).

New all-cause neurological symptoms were reported in 56/690 blocks (8.2%, 6.3–10.4%) at day 10, 37/1010 (3.7%, 2.7–5.0%) at 1 month and 6/1010 (0.6%, 0.27–1.3%) at 6 months (Tables 2 and 3). The lower block

Complicaciones neurológicas asociadas a bloqueos interescalénico y supraclavicular guiados con ecografía en cirugía electiva de hombro y extremidad superior. Estudio observacional prospectivo en un hospital universitario

A. Bilbao Ares[a,*], A. Sabaté[b], L. Porteiro[b], B. Ibáñez[c], M. Koo[b] y A. Pi[b]

Resultados: Fueron incluidos 121 pacientes, en los que se realizaron 96 bloqueos interescalénicos y 22 bloqueos supraclaviculares. Un 9,9% (IC 95% 5-15%) de los pacientes presentaron algún síntoma neurológico postoperatorio durante la primera semana. No hubo diferencias significativas entre el bloqueo interescalénico (9%) y el supraclavicular (14%). A los 3 meses los síntomas se mantuvieron en 9 pacientes (7,4%), permaneciendo en 4 de ellos (3,3%) la sintomatología al cabo de 1,5 años. Se realizó electromiograma en 3 de ellos, con resultado positivo para lesión nerviosa en todos ellos.

Tabla 2 Detalle de los pacientes con sintomatología nerviosa postoperatoria

	Cirugía	Bloqueo	Anestésico local y dosis	Profesional	Incidencias durante el bloqueo	Síntomas	Desaparición de síntomas	Electromiograma
Paciente 1	Prótesis invertida de hombro	Catéter supraclavicular	Bupivacaína 0,5% 15 ml + perfusión	Especialista	No	Hormigueo y acorchamiento en el antebrazo y la mano	Un año	
Paciente 2	EMO clavícula	Supraclavicular (posterior)	Ropivacaína 0,5% 15 ml	Especialista	Posible difusión intraneural	Pérdida total de sensibilidad en 1-3 dedos desde la IQ	> 1 año	Positivo (lesión a nivel de cuerda lateral)
Paciente 3	Fx olécranon y húmero	IE (posterior)	Ropivacaína 0,75% 15 ml	Especialista	No	Disminución de la sensibilidad en cara anterior de antebrazo	> 1 año	Positivo (mínima lesión en nervio radial)
Paciente 4	EMO clavícula	IE (posterior)	Mepivacaína 2% 10 ml	Especialista	No	Sensación de hormigueo en los dedos de la mano	Un año	
Paciente 5	Rotura del manguito. Sutura tendinosa	IE (anterior)	Ropivacaína 0,375% 20 ml	Especialista	No	Sensación de acorchamiento en la muñeca	Un año	
Paciente 6	Fx hombro derecho. Prótesis	Catéter supraclavicular	Ropivacaína 0,2% 10 ml + perfusión	Especialista	No	Sensación de hormigueo en los dedos 4º y 5º de la mano	5 meses	
Paciente 7	Fx cabeza del húmero	Catéter supraclavicular	Ropivacaína 0,45% 20 ml + perfusión	Especialista	No	Sensación de acorchamiento en cara anterior de la muñeca y dedos de la mano	2 meses	
Paciente 8	Luxaxión recidivante	IE (posterior)	Ropivacaína 0,75% 15 ml	Residente	No	Sensación de hormigueo en la punta de los dedos	5 meses	
Paciente 9	Osteocondroma. Prótesis total	Catéter IE (posterior)	Ropivacaína 0,75% 16 ml + 7 ml/h a 0,2%	Especialista	No	Acorchamiento de la cara anterior del antebrazo	2 meses	
Paciente 10	Luxación recidivante	IE (anterior)	Ropivacaína 0,75% 16 ml	Especialista	Dolor a la inyección	Acorchamiento en cara anterior	> 1 año	Pendiente
Paciente 11	Extracción prótesis hombro infectada	IE (posterior)	Ropivacaína 0,75% 10 ml	Residente	No	Hipoestesia en mano	> 1 año	Positivo (lesión plexo C5-C6 posganglionar)
Paciente 12	Rotura del manguito de los rotadores	IE (posterior)	Ropivacaína 0,75% 15 ml	Residente	Dolor al inyectar el AL	Acorchamiento en la punta de los dedos de la mano	Un mes	

AL: anestésico local; EMO: extracción de material de osteosíntesis; IE: interescalénico; IQ: intervención quirúrgica; Fx: fractura.

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A. Bilbao Ares[a,*], A. Sabaté[b], L. Porteiro[b], B. Ibáñez[c], M. Koo[b] y A. Pi[b]

Podemos concluir que hemos documentado una elevada incidencia de síntomas neurológicos postoperatorios tras la realización del bloqueo nervioso, así como un preocupante porcentaje de permanencia de la sintomatología en un 3% de los pacientes al año de seguimiento. No hemos hallado diferencias significativas entre los 2 tipos de bloqueo estudiados y tampoco se han encontrado otros factores que parezcan influir en el riesgo de padecerlos. Consideramos que esta complicación es frecuente y, debido a su relevancia, debemos explicarla con detalle a nuestros pacientes al obtener su consentimiento.

Complications associated with 27 031 ultrasound-guided axillary brachial plexus blocks

A web-based survey of 36 French centres

Eur J Anaesthesiol 2014; **31:**606–610

Claude Ecoffey, Emmanuel Oger, Florence Marchand-Maillet, Yann Cimino, Jean-Jérome Rannou, Hélène Beloeil, SOS French Regional Anaesthesia Hotline

RESULTS Of 27 031 blocks performed, the incidence of systemic toxicity of local anaesthetic was very low at 1.5 per 10 000, and the overall incidence of postoperative neurological symptoms was 0.37 per 10 000.

CONCLUSION We have reported a large series of ultrasound-guided axillary brachial plexus blocks in a multicentre study. Our results confirm the low incidence of local anaesthetic systemic toxicity and postoperative neurological complications as previously described.

In conclusion, we report a large series of ultrasound-guided axillary brachial plexus blocks in a multicentre study. The incidence of systemic toxicity of local anaesthetic in 27 031 blocks was 1.5 per 10 000, and the overall incidence of postoperative neurologic symptoms was 0.37 per 10 000.

- SOME DEMOSTRATIVE VIDEOS:
  - ANATOMICAL VARIATIONS
  - NERVE PATHOLOGY
  - NEEDLE APPROACHES
  - INTRANEURAL VS EXTRANEURAL NEEDLE
- SAFETY ALGORITHM FO US-GUIDED NERVE BLOCK
- NERVE AUTOPROTECTION.
  - MACRO AND MICROANATOMY OF NERVES
  - A COMMON SENSE “POINT OF VIEW”

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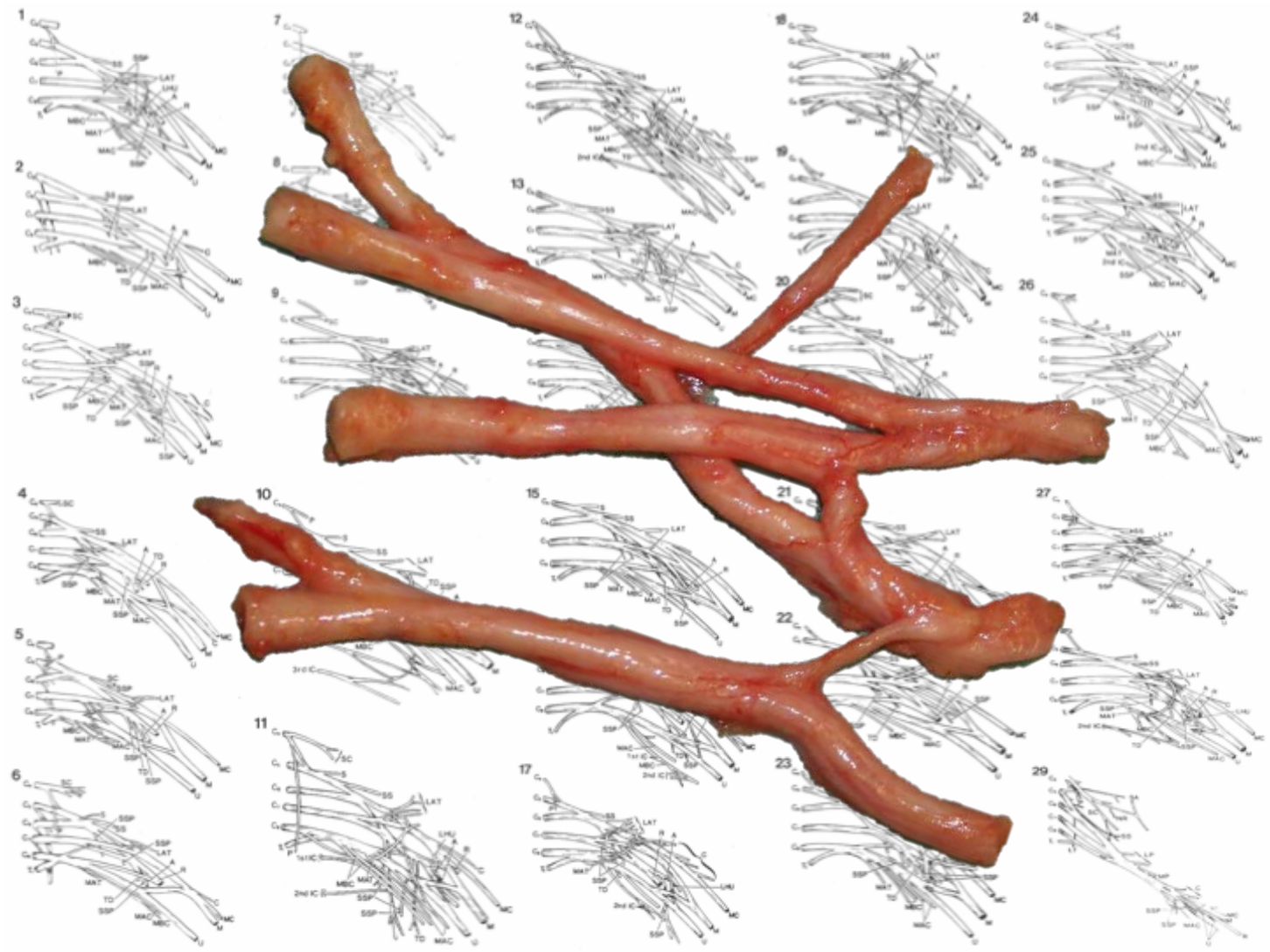

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Ultrasound of the Peripheral Nerves

Kamen V. Vlassakov[1,2,*] and Xavier Sala-Blanch[3]

[1] Department of Anesthesiology, Perioperative and Pain Medicine, Brigham and Women's Hospital, Boston, Massachusetts, USA. [2] Department of Anesthesiology, Harvard Medical School, Boston, Massachusetts, USA. [3] Universitat de Barcelona Medical School and Hospital Clínic de Barcelona, Barcelona, Spain.

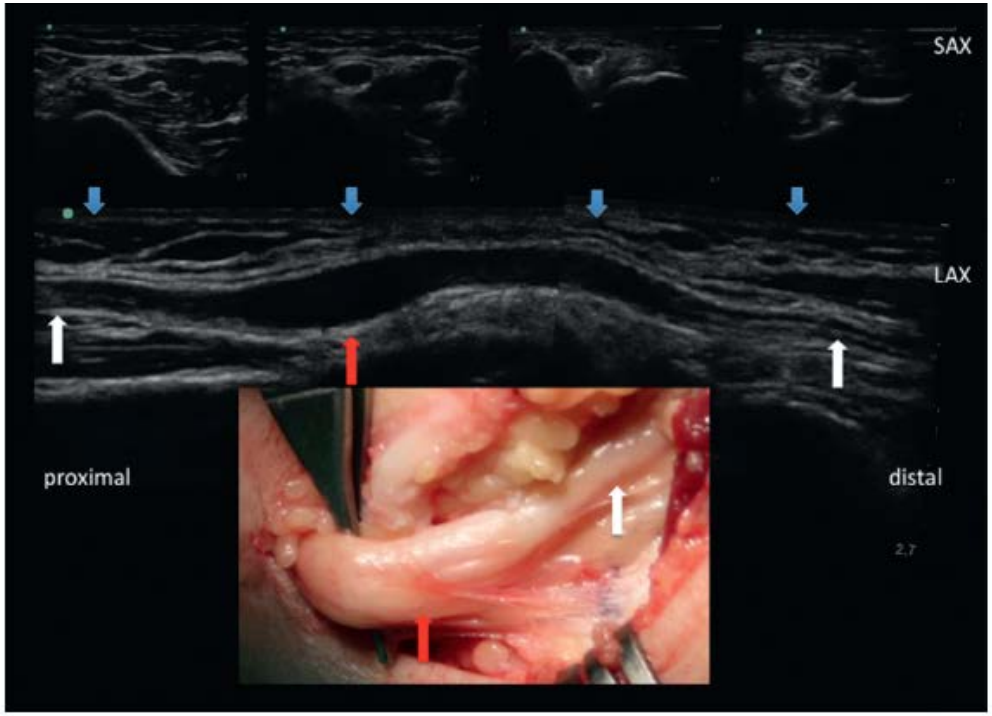

FIGURE 16.10 Ulnar nerve entrapment at the level of the elbow. Normal echostructure both proximally and distally (white arrows), and nerve enlargement just proximal to the entrapment site (red arrow). Surgical exposure of the nerve.

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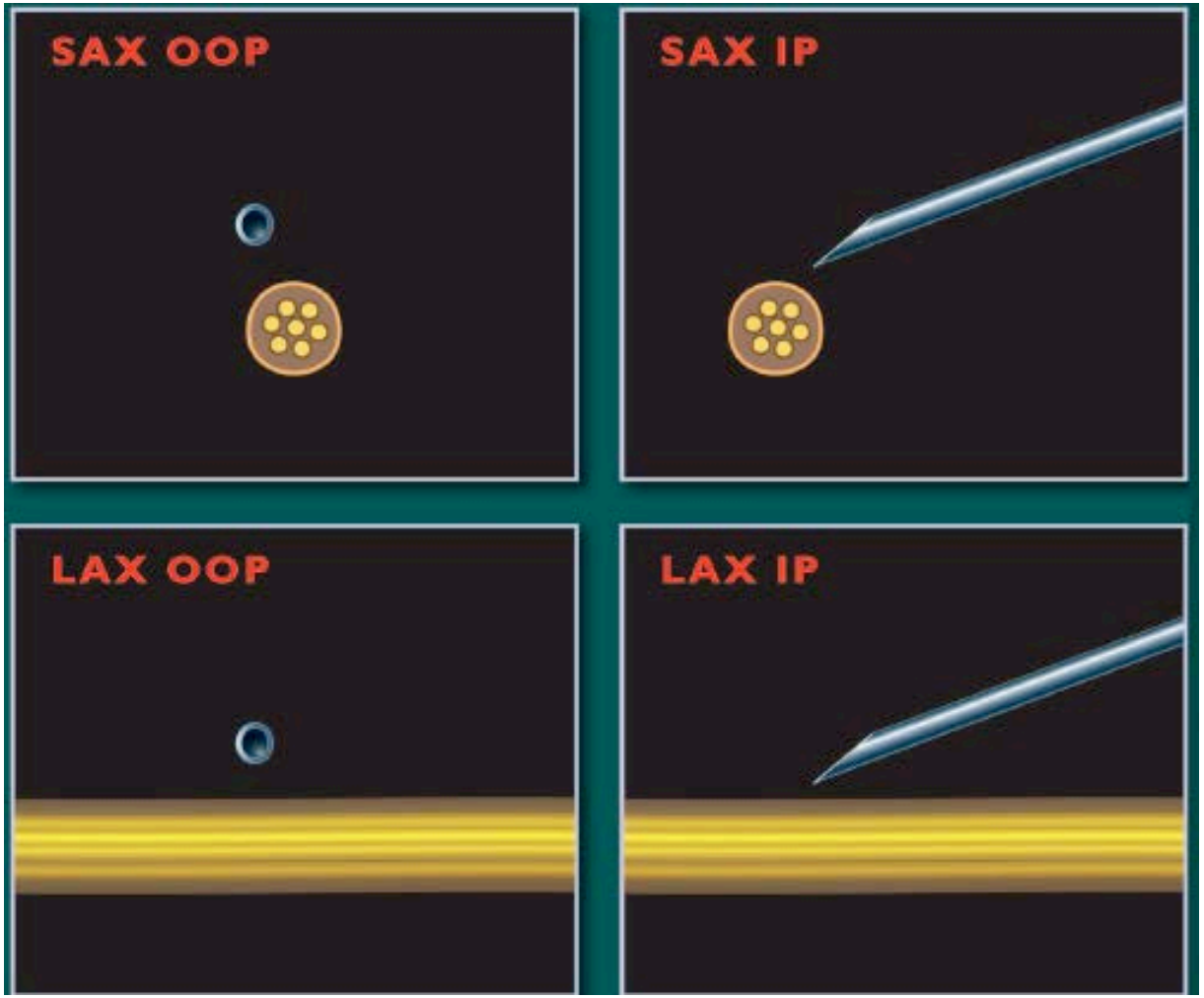
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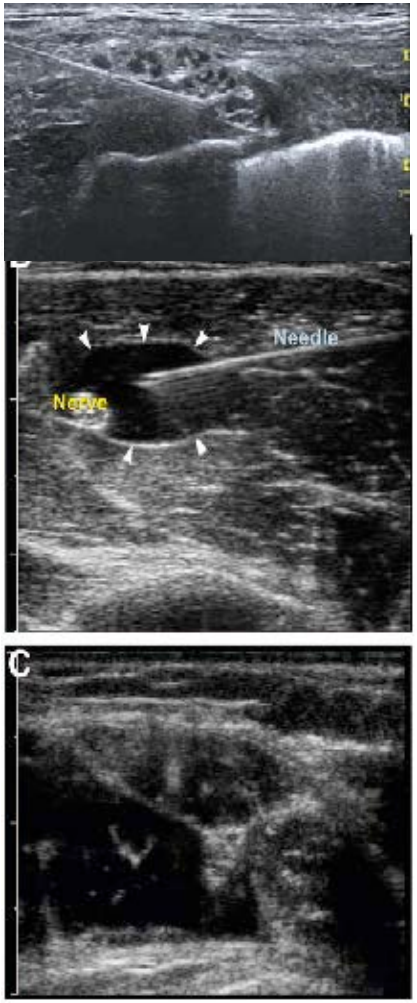
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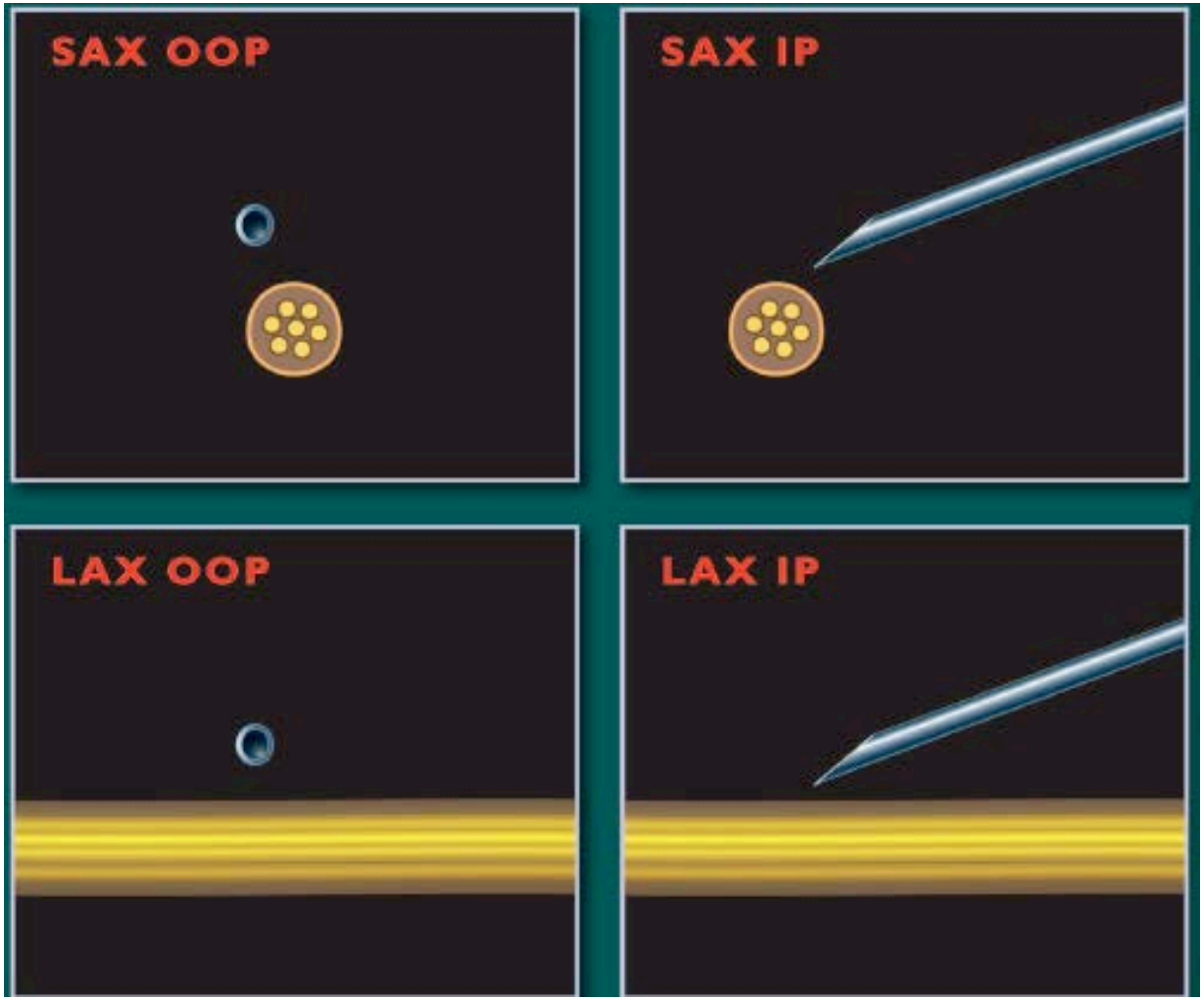
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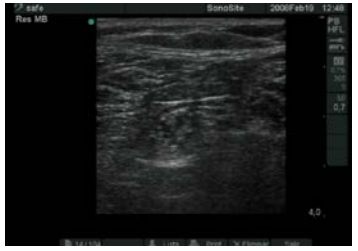

Plexus Anesthesia

Volume I

Perivascular Techniques of Brachial Plexus Block

ALON P. WINNIE, M.D.
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Layout

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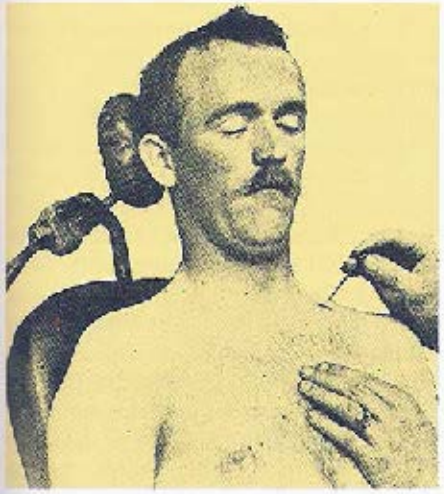
Schultz Medical Information ApS
Copenhagen

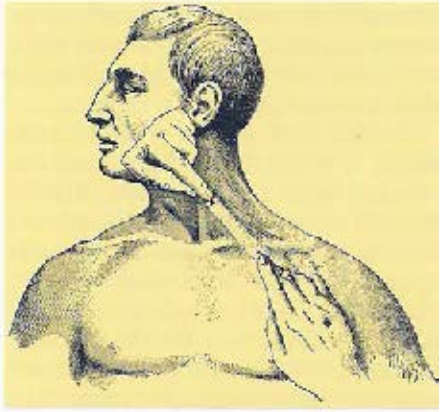
II. Historical Considerations

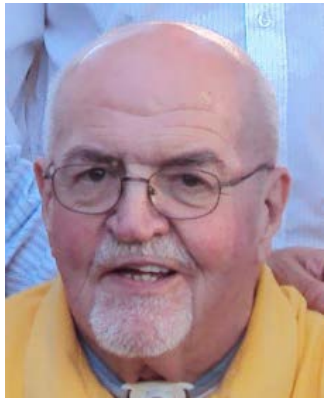
"Those who do not remember the past are condemned to relive it."
Santayana



V. Considerations Concerning Complications, Side Effects and Untoward Sequelae

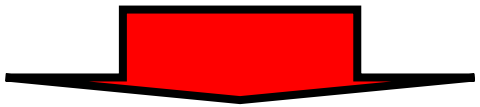
"When there are problems with any regional technique, look for the cause first on the proximal end of the needle."
Winnie





history

1900	Halsted	Dissection	Intraneural injection
1911	Hirschel – Kulenkampff	Percutaneous	Paresthesia
1949	Accardo-Adriani	Percutaneous	Multiple paresthesia
1970		Percutaneous	Nerve stimulation
1980	stimulation	Percutaneous	Multiple nerve
2000			



History: Perineural vs intraneural

- Injection péri-nerveuse ou endo-nerveuse par voie sous-cutanée. ...la recherche des troncs nerveux avec la pointe ou de l'aiguille est indistensable.... Un très bon indice dans tous les cas est fourni par les paresthésies rayonnant vers la périphérie, qui sucèdent au contact du nerf par l'aiguille.... Celle-ci prouve certainement que l'aiguille est en bonne place. .... Le temps qu'il fault attendre après l'injection dépends de la façon don't on a atteint the nerfs. Si on met l'aiguille dans le tronc, l'interruption est presque instantanée. Si l'on n'a pu injecter l'anesthésique qu'autour du nerf, cinq à vingt minutes se passent avant l'interruption.
- Injection directe endo-nerveuse a ciel ouvert
  - Il se produit alors un gonflement fusiforme du nerf qui, du reste, disparait rapidement. Le liquide injecté diffuse des deux cotés, c'est pourquoi une injection endo-neurale peut agir sur les rameaux du nerf qui ont quitté le tronc à proximité du point injecté.

FAST BLOCK ONSET
INTRANEURAL SIGNS

Transient fusiform enlargement of the nerve
Difussion both sides
Difussion along the branches

L'anesthésie régionale. Victor Pauchet 1914

Societat Catalana d'Anestesiologia, Reanimació i Terapèutica del Dolor

History: Perineural vs intraneural

ETIOLOGY:

Intraneural injections have been condemned as causing nerve damage by pressure or by combination of this and action of the drug on the nerve tissure. This is open to debate. ***My associates and I have made what we believed to the intraneural injections into the divisions of the brachial plexus as well as into the sciatic nerve using 10 cc. of solution without causing nerve damage.***

PROPHYLAXIS:

Although it seens questionable that intraneural injections result in nerve lesions, ***it is perhaps best to avoid such injections since satisfactory anesthesia may be obtained by injecting the anesthetic agent in close proximity to the nerve.***

COMPLICATIONS OF REGIONAL ANESTHESIA.
DANIEL C. MOORE. 1955.

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- NERVE AUTOPROTECTION.
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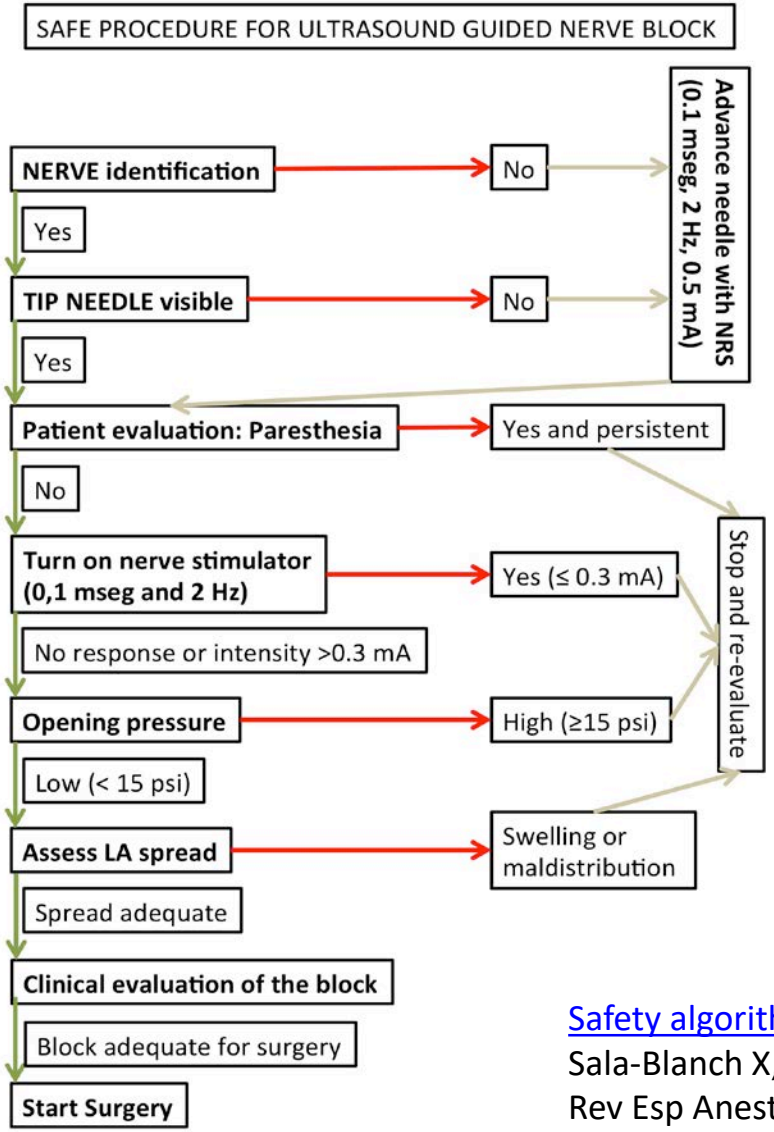
  - A COMMON SENSE “POINT OF VIEW”



I. Morphological (US)
II. Functional (Paresthesia/NRS)
III. Mechanical (Pressure / Spread)

1.- Adquired the knowledge

2.- Adquired the skills

3.- Identify the nerve

3b.- Identify nerve pathology

4.- Always control the needle's tip

5.- No advance the needle directly to the nerve

6.- Evaluate the patient (paresthesia, pain, etc.)

7.- Evaluate motor response (NRS <0.3 mA)

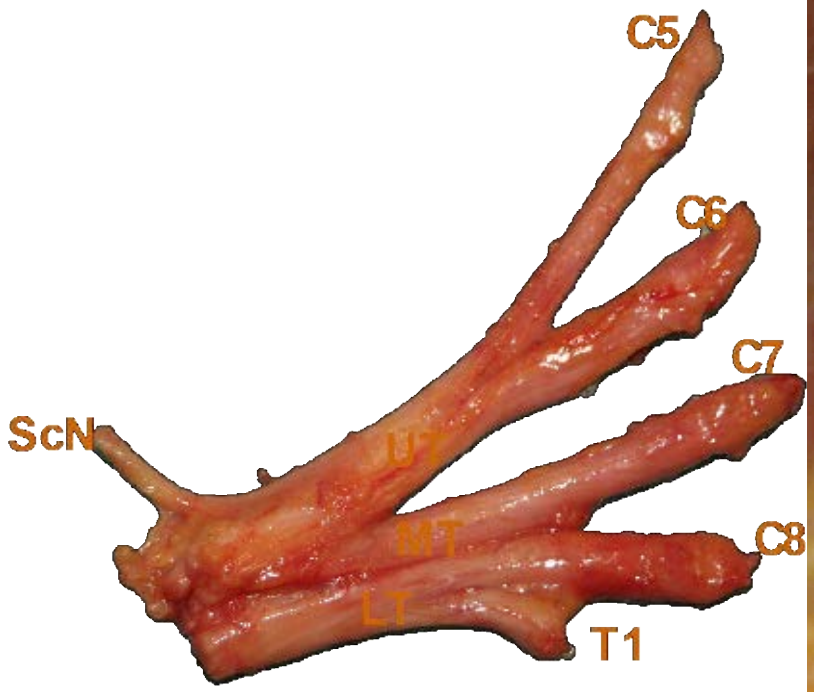
8.- Control the pressure (>15 psi)

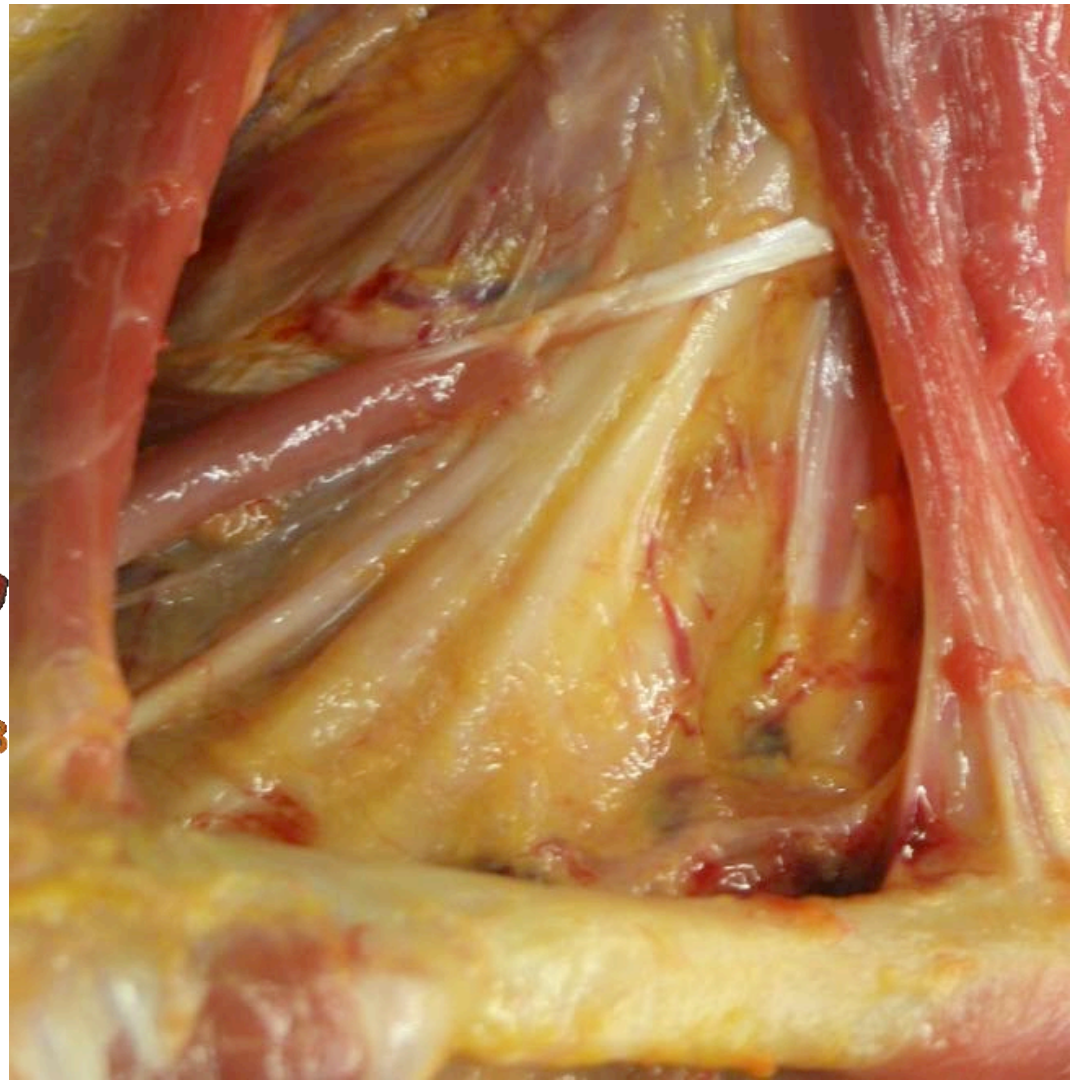
9.- Control LA spread (Swelling)

Safety algorithms for ultrasound-guided blocks: The next challenge.
Sala-Blanch X, Lopez AM, Vandepitte C.
Rev Esp Anestesiol Reanim. 2014.

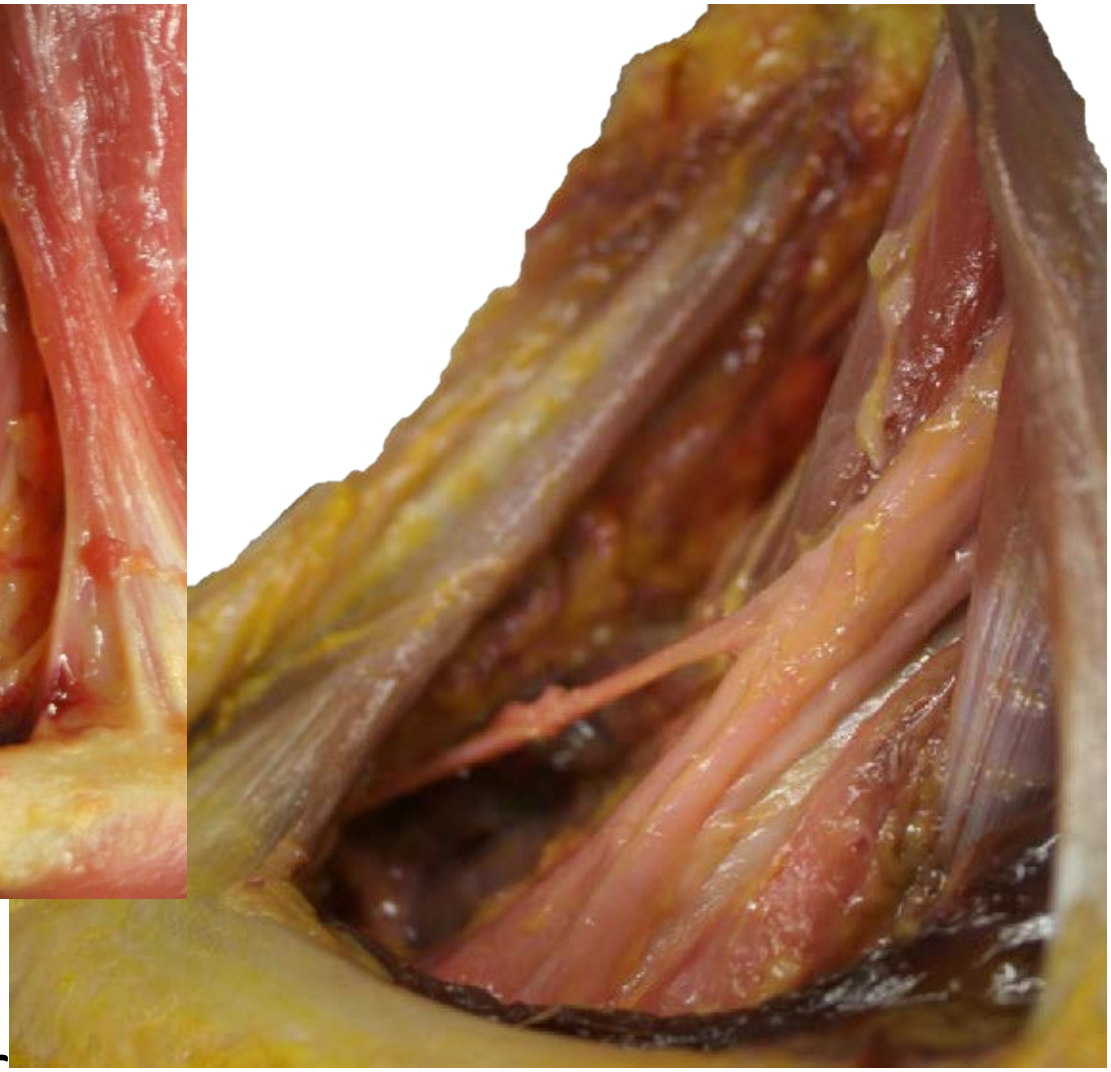
- SOME DEMOSTRATIVE VIDEOS:
  - ANATOMICAL VARIATIONS
  - NERVE PATHOLOGY
  - NEEDLE APPROACHES
  - INTRANEURAL VS EXTRANEURAL NEEDLE
- SAFETY ALGORITHM FO US-GUIDED NERVE BLOCK
- NERVE AUTOPROTECTION.
  - MACRO AND MICROANATOMY OF NERVES
  - A COMMON SENSE “POINT OF VIEW”

Gross anatomy of nerves





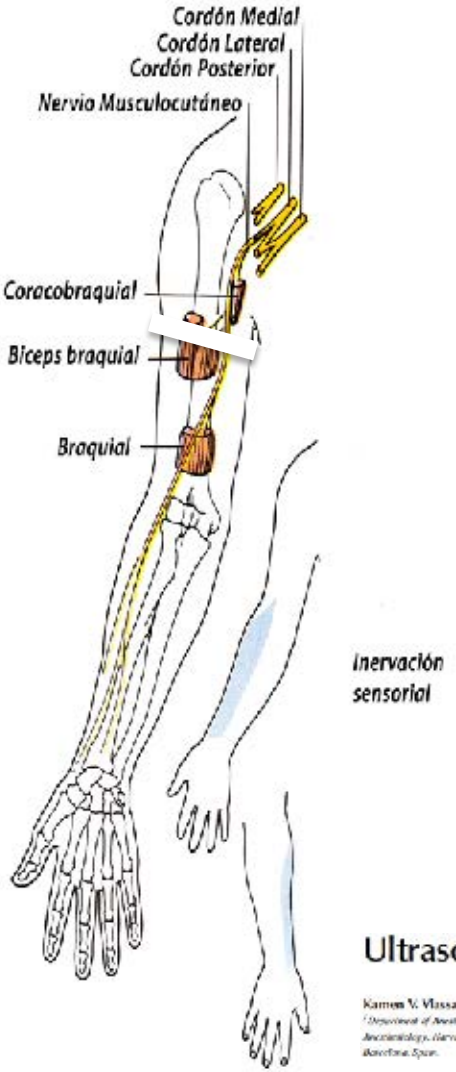
Gross anatomy of nerves

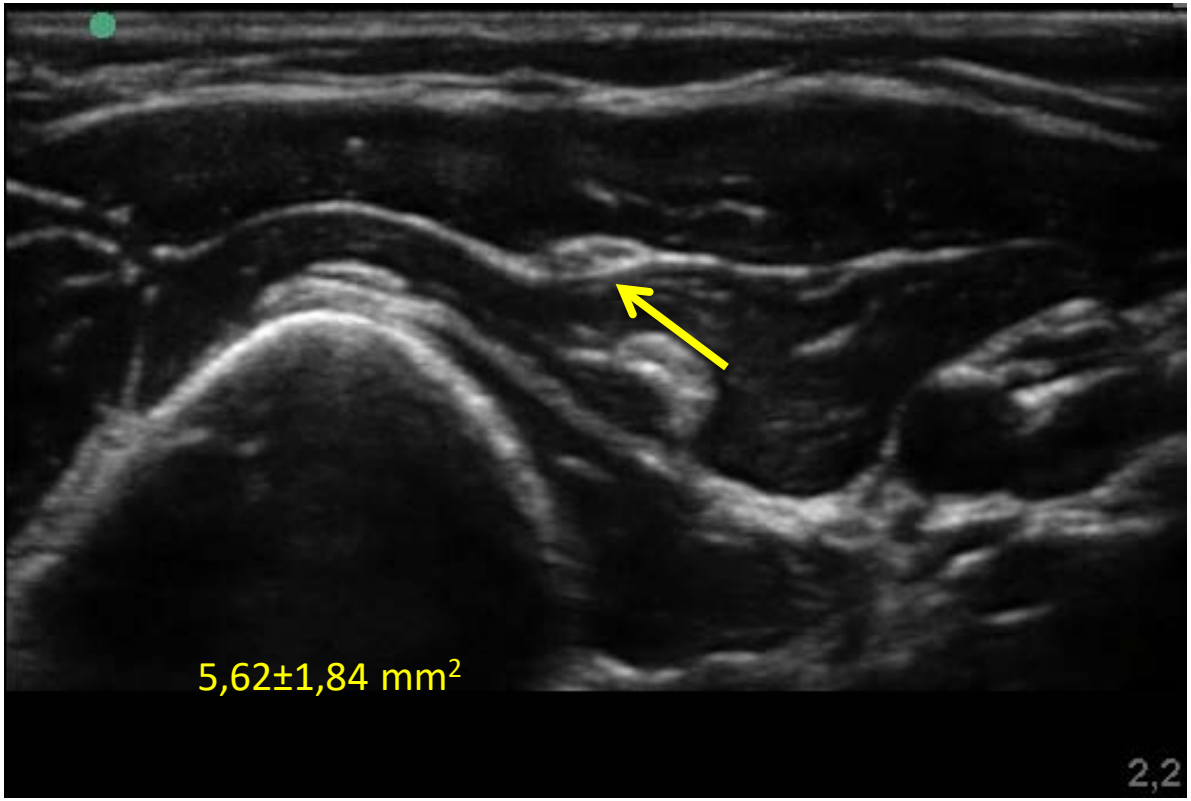


Gross anatomy of nerves

Gross anatomy of nerves

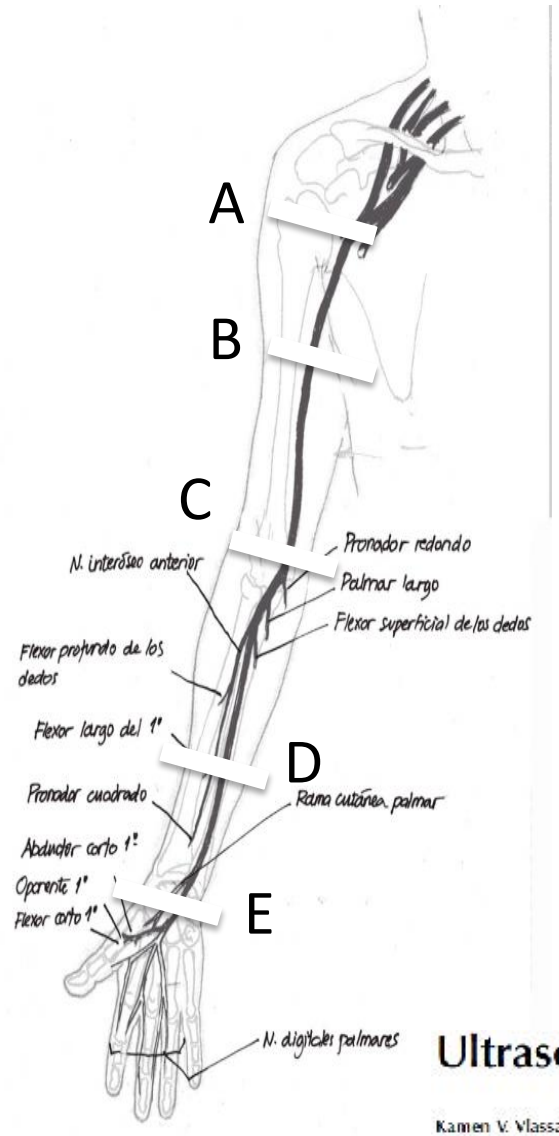
Nervio Musculocutáneo

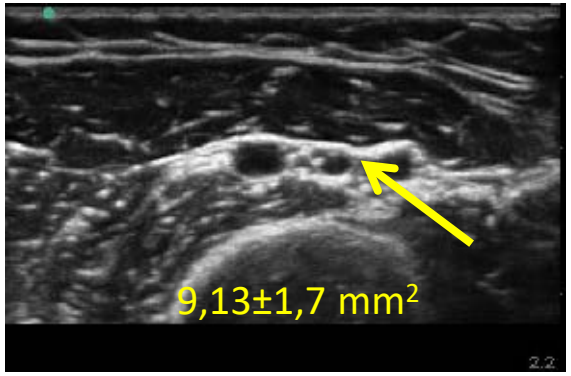




Ultrasound of the Peripheral Nerves

Kamen V. Vlassakov[1,2] and Xavier Sala-Blanch[3]





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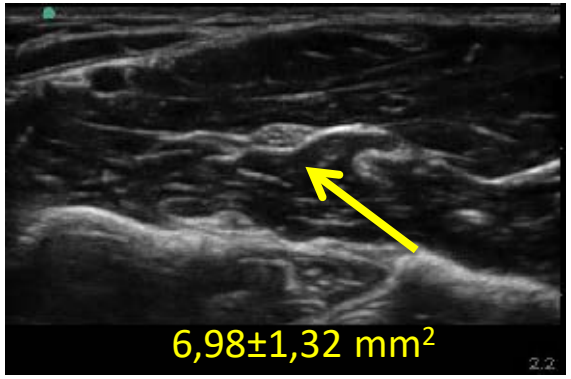

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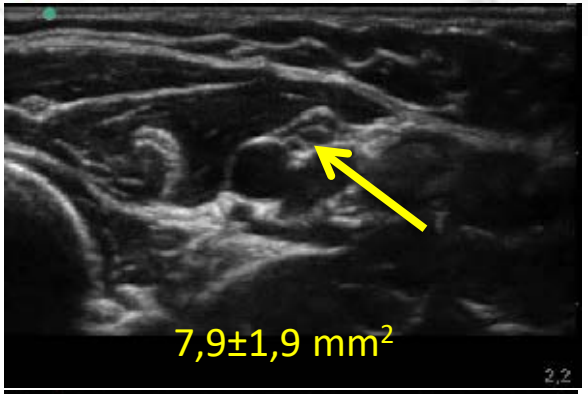
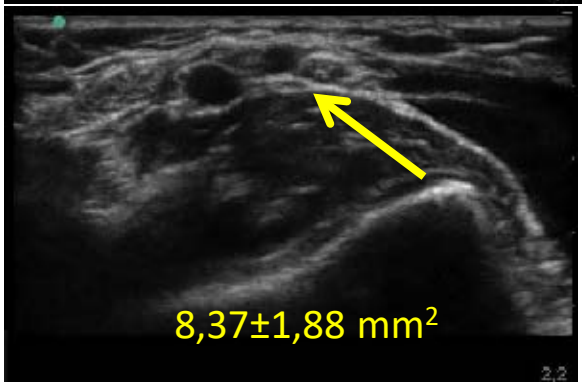
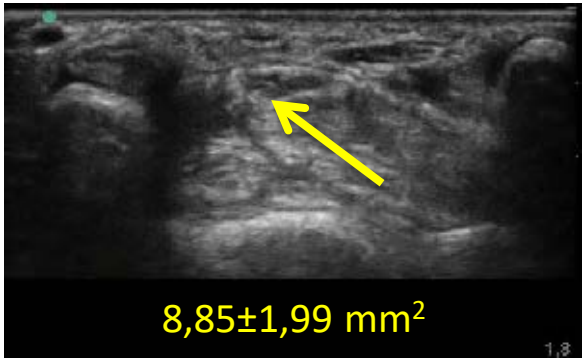


C

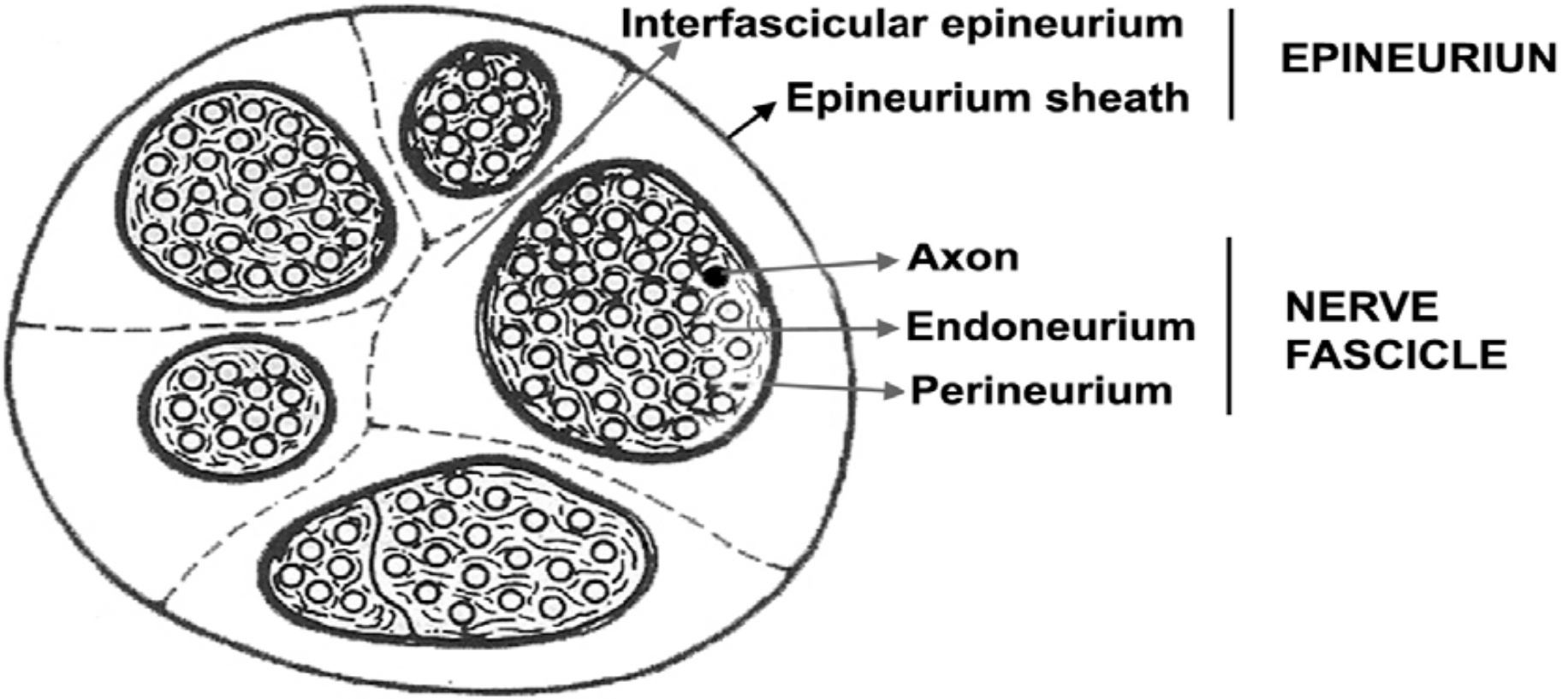


E

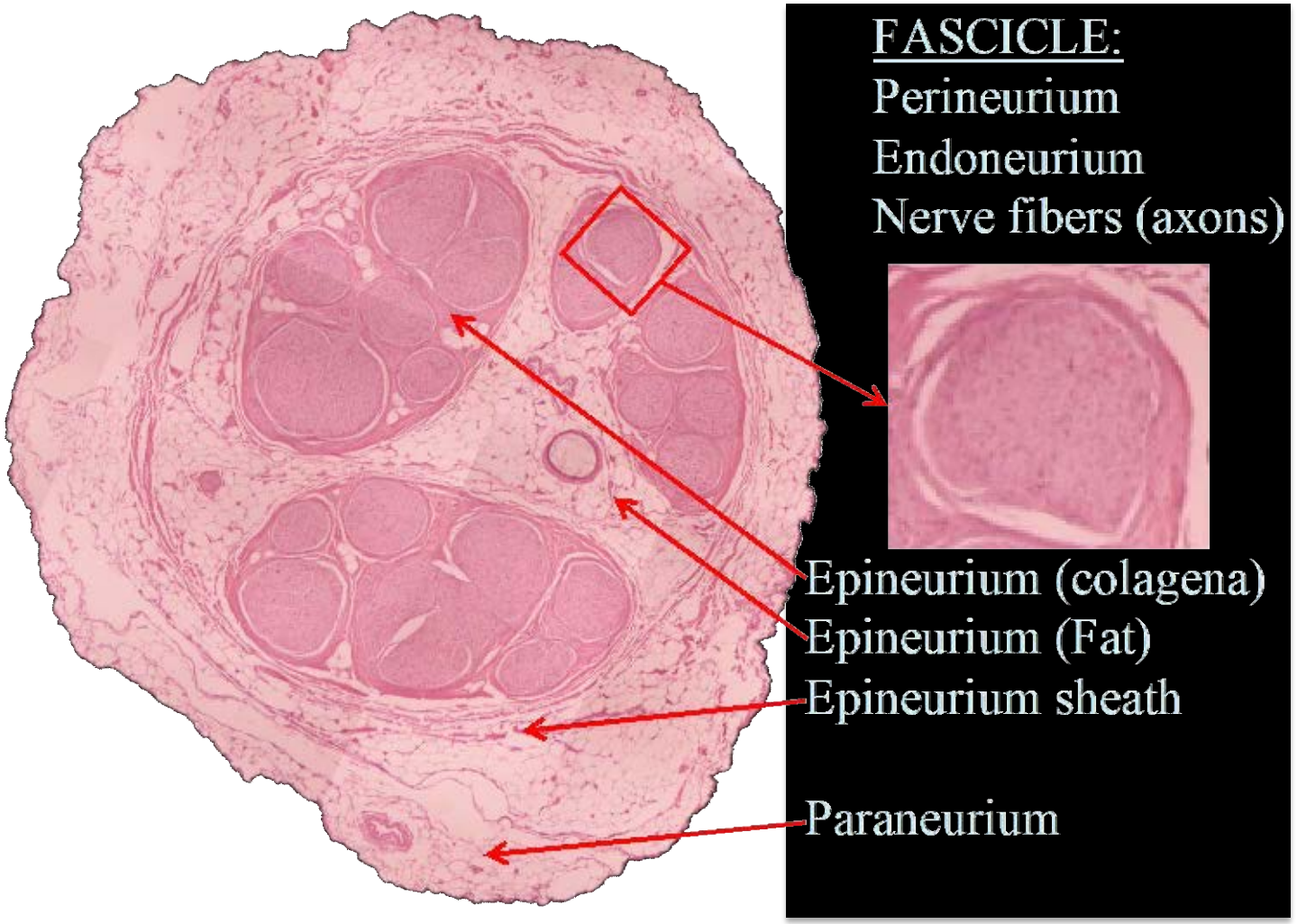


Ultrasound of the Peripheral Nerves

Kamen V. Vlassakov[1,2,*] and Xavier Sala-Blanch[3]



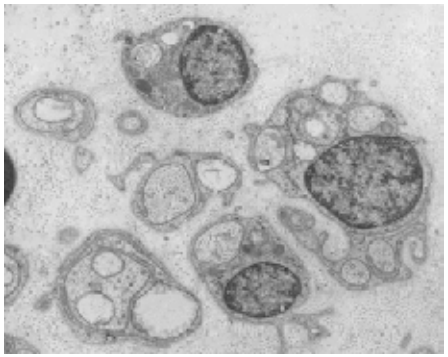
Microscopy of nerves

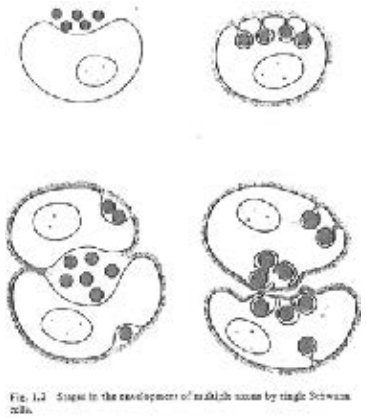


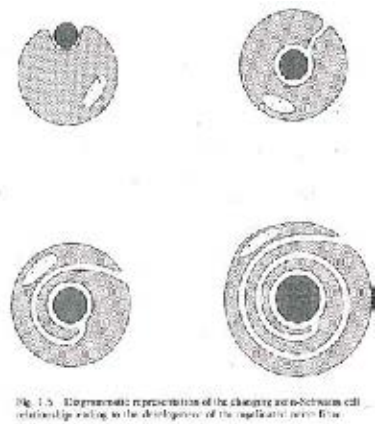
Microscopy of nerves

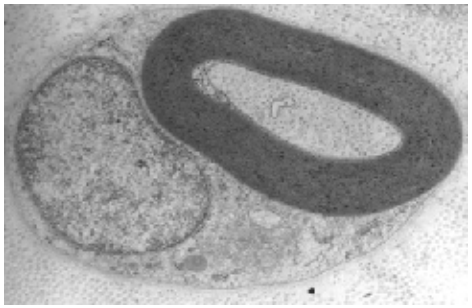
Tipo de fibra	Función	Diámetro (µm)	Mielina	Velocidad de conducción (m/s)	Orden de bloqueo
Aα	Motora	12-20	+	70-120	4
Aβ	Tacto, presión	5-12	+	30-70	3
Aγ	Tono muscular	3-6	+	15-30	3
Aδ	Dolor, temperatura	2-5	+	12-20	2
B	Preganglionar SNS	<3	+	3-15	1
SC	Postganglionar SNS	0,3-1,3	-	0,7-1,3	1
dγC	Dolor	0,4-1,2	-	0,5-2,2	1

Fibras B y sC (funciones autónomas): vasodilatación.
Fibras dγC (sensación dolorosa): analgesia.
Fibras Ad (sensibilidad térmica y dolorosa): analgesia.
Fibras Aa (conducción motora y propiocepción): pérdida de actividad motriz y sensibilidad táctil.



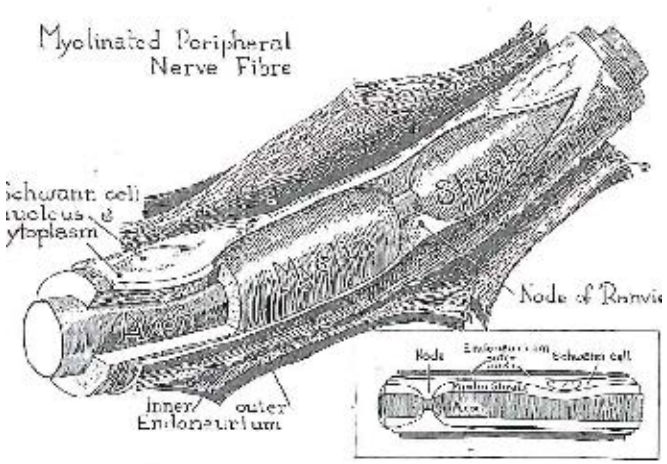






Autoprotection concept

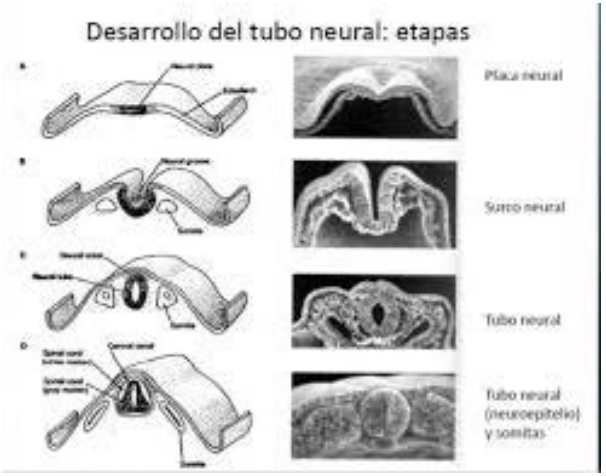
1st step nerve protection: connective tissue

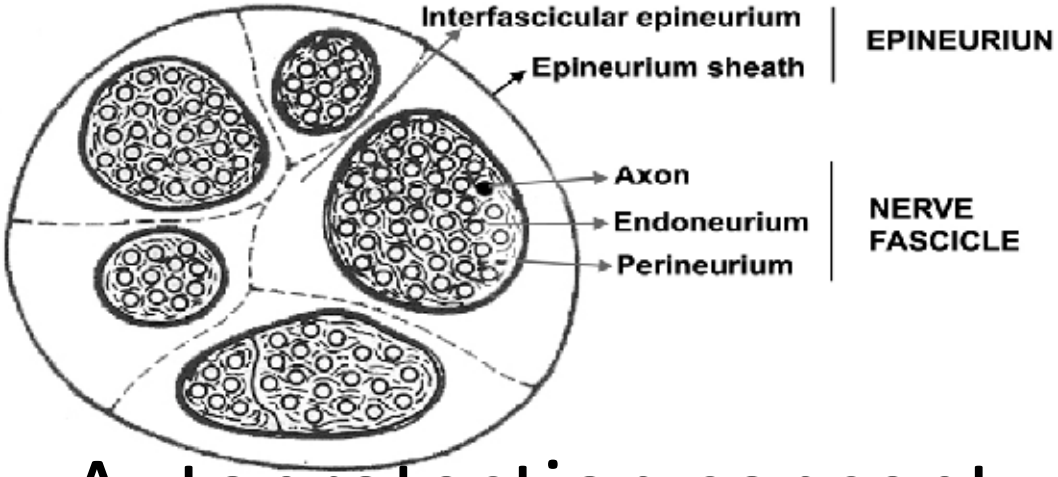


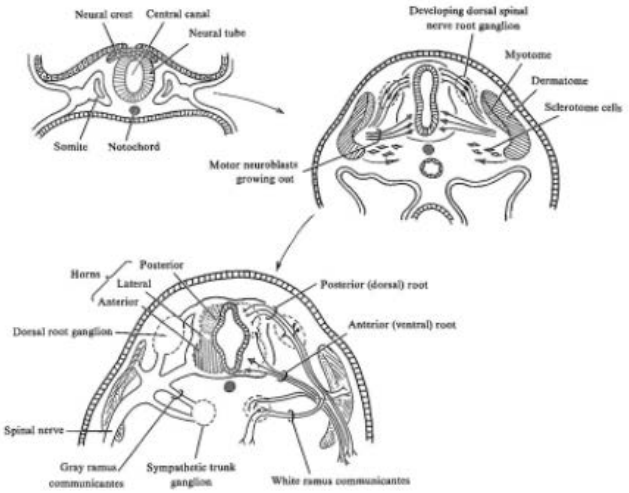
Ectoderm:

NEURAL CREST

Mesoderm







Autoprotection concept

1st step nerve protection: connective tissue

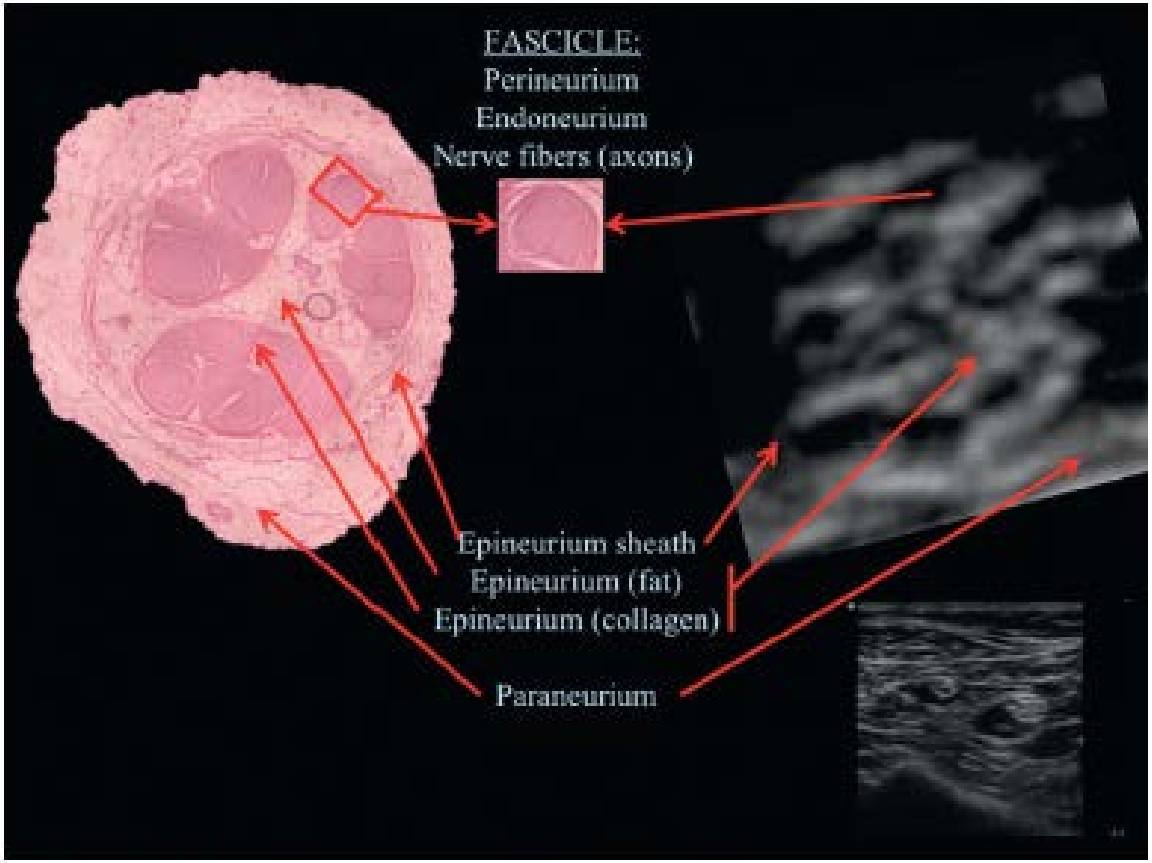
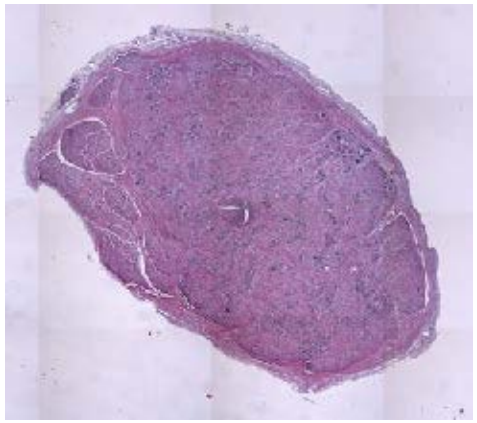
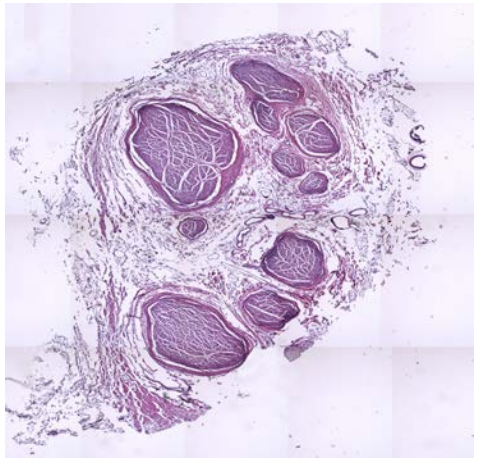


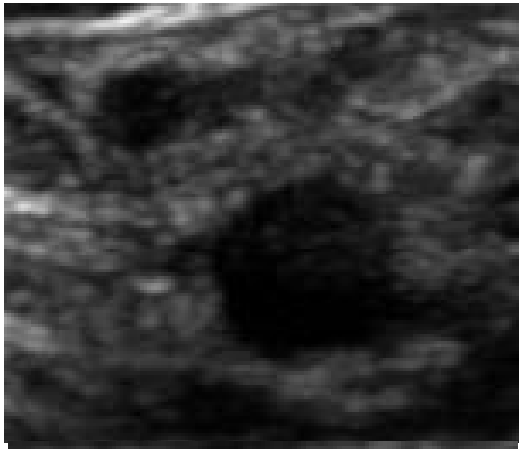
FIGURE 16.2 Echostructure of a peripheral nerve (honeycomb). Hypoechoic areas correspond to fascicles or fascicular groups while hyperechoic areas correspond to epineural tissue.

2nd step nerve protection: Fascicular plexus





C6



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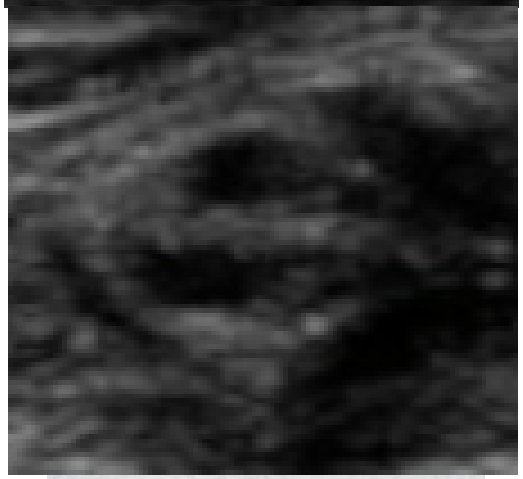


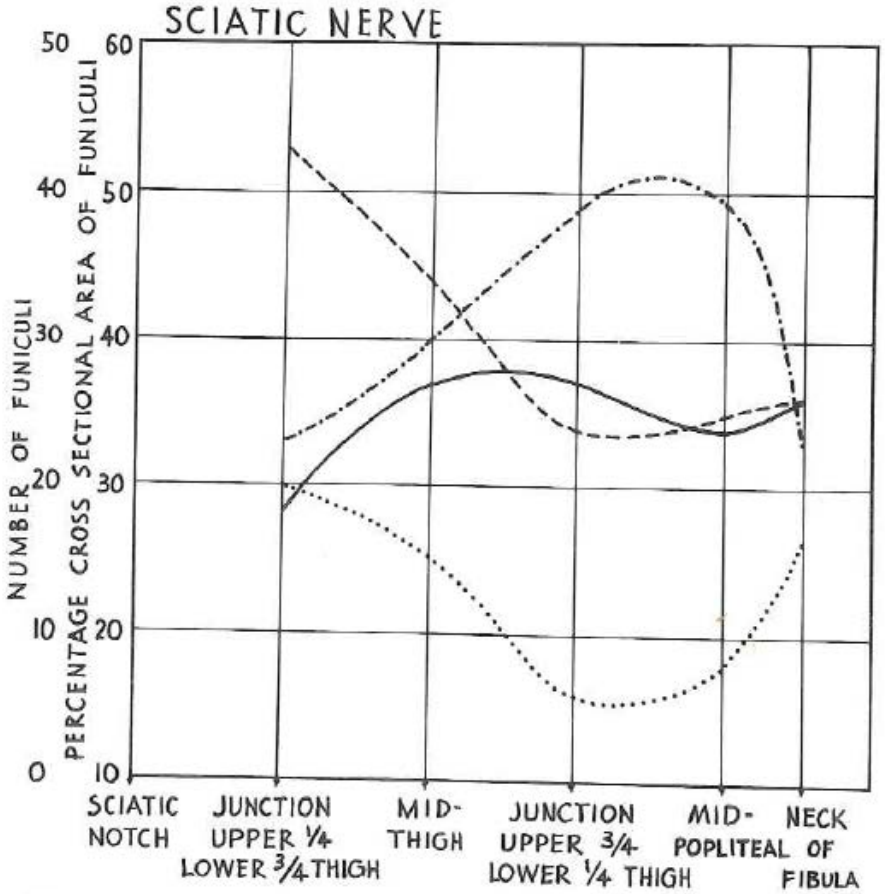


Fig. 68.6 Graphic representation of the average percentage funicular area and the average number of funiculi based on measurements at five levels in 20 specimens of the sciatic nerve. Tibial division: Percentage funicular area ——; Number of funiculi -----. Common peroneal division: Percentage funicular area, ——————; Number of funiculi, ...

Table 2.1 Funicular numbers. Smallest and greatest numbers of funiculi regardless of specimen and level.

Nerve	Smallest	Greatest
Median	3	37
Ulnar	1	36
Radial	1	36
Sciatic (buttock)	43	137
Medial popliteal	11	93
Lateral popliteal	1	36

Table 2.2 Examples of the extent to which the numbers of funiculi may change along individual nerves.

Median	Ulnar	Radial	Medial popliteal	Lateral popliteal
3 to 22	1 to 8	1 to 20	11 to 27	1 to 15
3 to 18	1 to 18	2 to 13	16 to 33	1 to 21
4 to 13	2 to 17	2 to 36	17 to 27	4 to 26
5 to 16	3 to 8	3 to 32	22 to 36	5 to 20
7 to 28	6 to 20	5 to 29	28 to 93	7 to 22
11 to 35	12 to 36	8 to 16	32 to 83	7 to 36
15 to 36	15 to 30	8 to 29	33 to 56	8 to 24

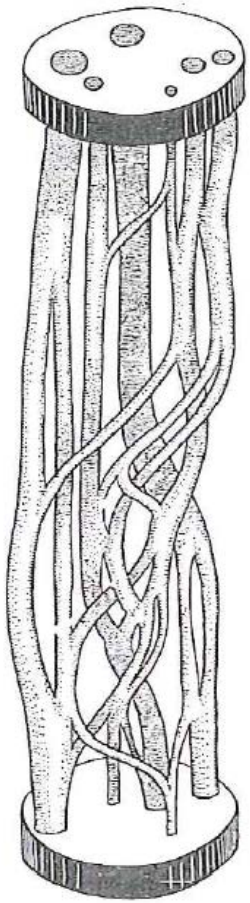


Fig. 2.2 Funicular plexus formations in a 3 cm segment of a specimen of the musculocutaneous nerve of the arm.

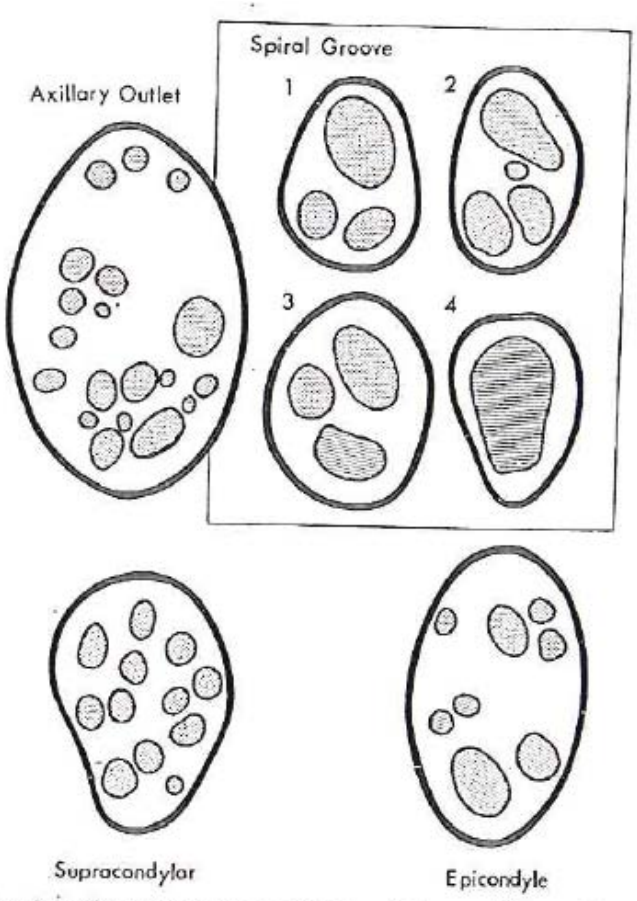


Fig. 2.3 Sections from a specimen of the radial nerve illustrating variations in the size and number of the funiculi along its length.

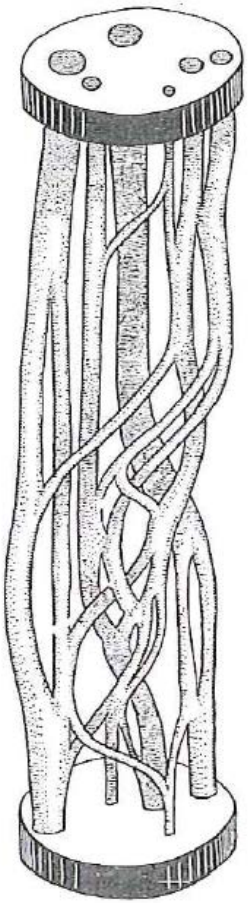
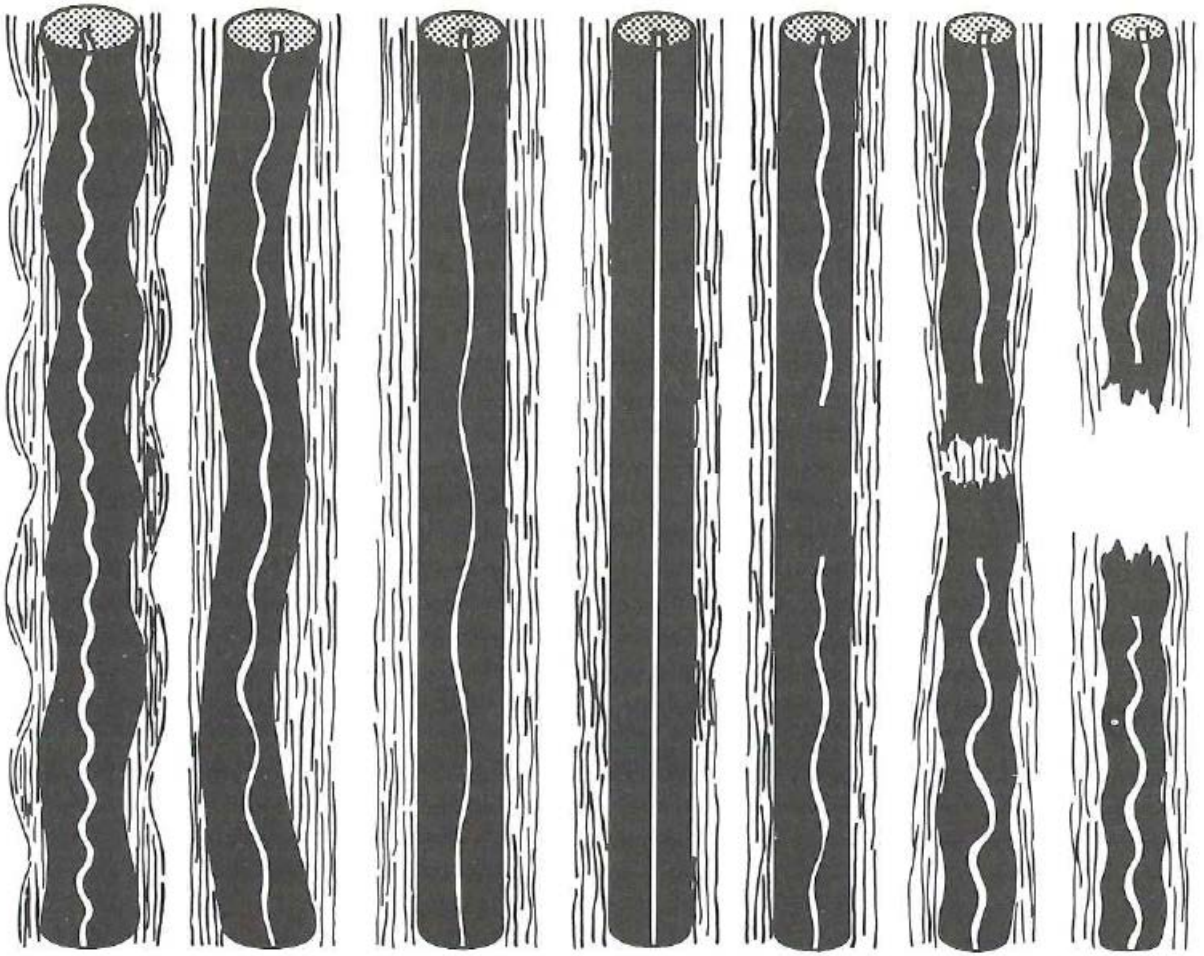


Fig. 2.2 Funicular plexus formations in a 3 cm segment of a specimen of the musculocutaneous nerve of the arm.

2nd step nerve protection: Fascicular plexus



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2nd step nerve protection: Fascicular plexus

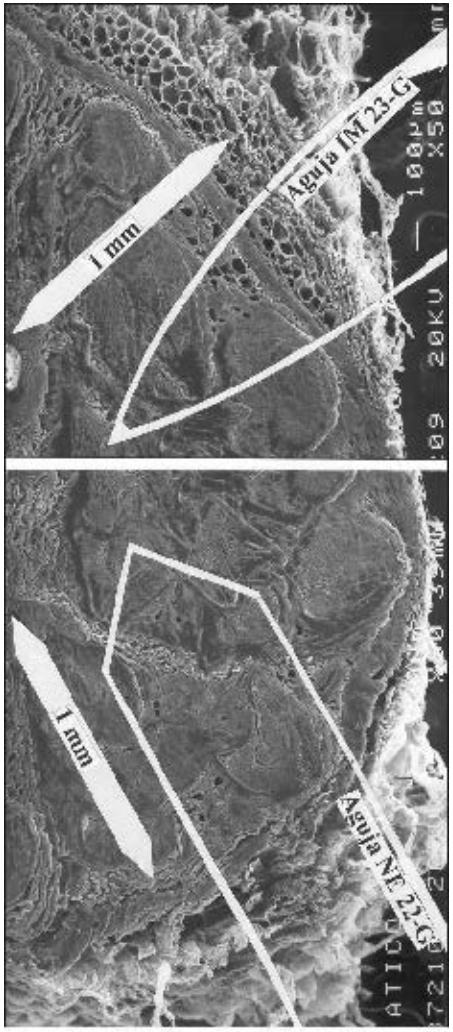
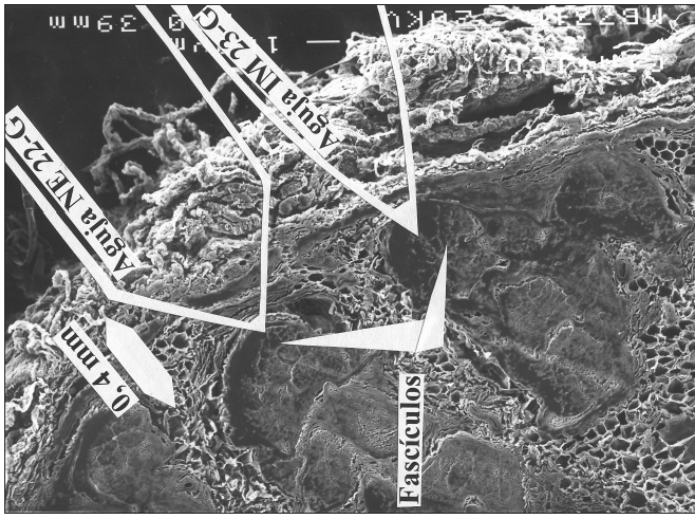


Fig. 5. Modelo en el que se superpone la imagen de una sección transversal del nervio ciático y la proyección de las agujas de bisel corto y largo manteniendo la proporción de dimensiones entre las estructuras. Obsérvese las estructuras en contacto con la punta de la aguja a 1 mm de profundidad. Microscopía electrónica de barrido. Aumento 50x.

(Rev. Esp. Anestesiol. Reanim. 2003; 50: 274-283) ORIGINAL

Posibilidad de lesiones nerviosas relacionadas con los bloqueos nerviosos periféricos. Un estudio en nervio ciático humano con diferentes agujas

M. A. Reina[1,2a], A. López[1,2b], J. A. De Andrés[3,c], F. Machés[2a]



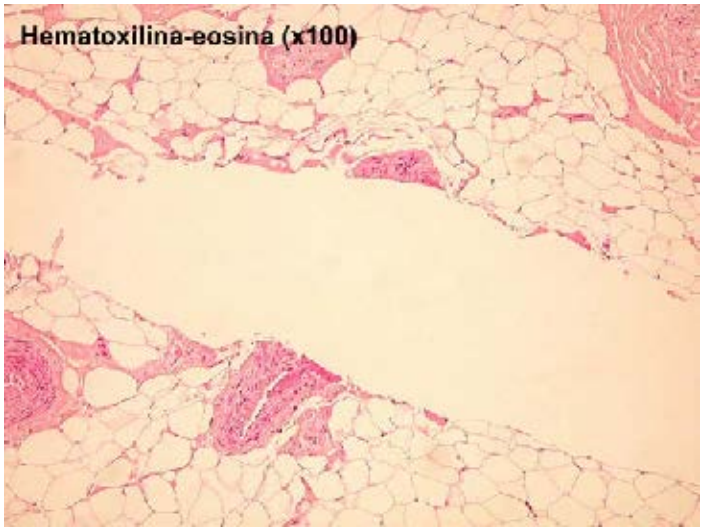
CONCLUSIONES: Las parestesias pueden desencadenarse por compresión fascicular con lesión superficial que afectará sólo al epineuro y sin alteraciones futuras, o con rotura del perineuro que se asociará a una alteración de la barrera hemato-nerviosa. Las parestesias no son inocuas para el nervio y su frecuencia puede disminuirse usando técnicas de neuroestimulación para su localización.

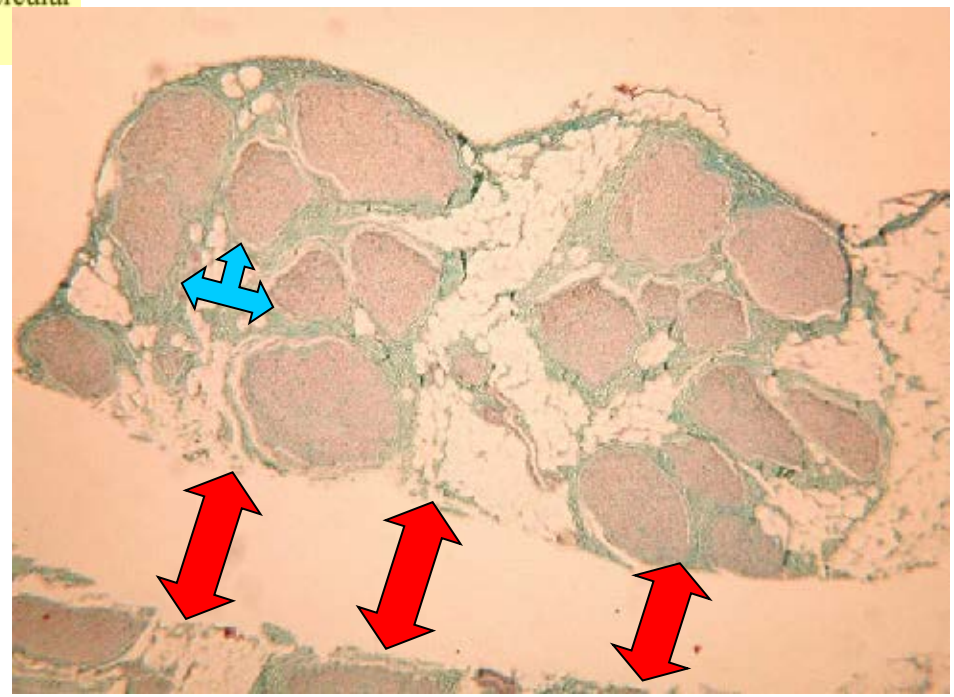
2nd step nerve protection: Fascicular plexus

Structural Injury to the Human Sciatic Nerve After Intraneural Needle Insertion

Conclusions: Our findings suggest that intraneural needle insertion may more commonly result in interfascicular rather than intrafascicular needle placement.

(*Reg Anesth Pain Med* 2009;34: 201–205)





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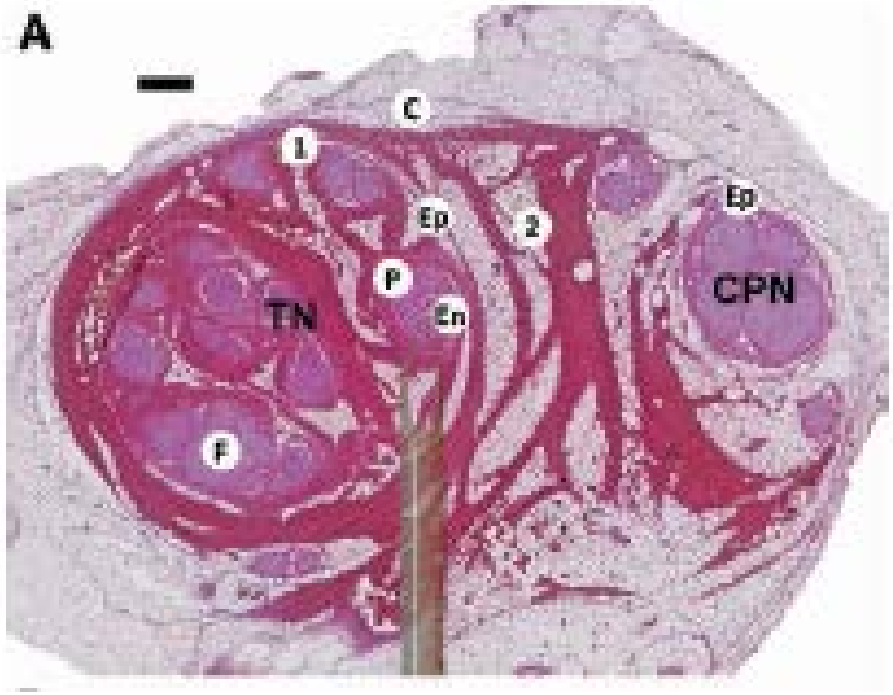
2nd step nerve protection: Fascicular plexus

ANESTHESIOLOGY

Extrafasicular and Intraperineural, but No Endoneural, Spread after Deliberate Intraneural Injections in a Cadaveric Study

Miguel A. Reina, M.D., Ph.D., Xavier Sala-Blanch, M.D., Enrique Monzó, M.D., Ph.D., Olga C. Nin, M.D., Paul E. Bigeleisen, M.D., Ph.D., André P. Boezaart, M.D., Ph.D.

ANESTHESIOLOGY 2019; 130:00–00



Conclusions: After deliberate intraneural injection, longitudinal and circumferential extrafascicular spread occurred in all instances in the neural compartments that contained adipocytes, but not in the relatively solid endoneurium of the fascicles.

3th step nerve protection: Nerve divisions

3th step nerve protection: Nerve divisions




3th step nerve protection: Nerve divisions

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3st step nerve (complex nerves) protection:

Conective tissue of Plexular nerves

Injection Inside the Paraneural Sheath of the Sciatic Nerve

Direct Comparison Among Ultrasound Imaging, Macroscopic Anatomy, and Histologic Analysis

Henning Lykke Andersen, MD, Sofie L. Andersen, MD,† and Jørgen Tranum-Jensen, MD‡*

Connective Tissues Associated With Peripheral Nerves

Carlo D. Franco, MD

Regional Anesthesia and Pain Medicine • Volume 37, Number 4, July-August 2012

The sciatic nerve is formed by 2 nerves: tibial and common peroneal. They are independent nerve structures that do not mix their fibers,[15] but they happen to share a long trajectory in the gluteal region and posterior thigh until they diverge from each other in the popliteal fossa.[11,12]

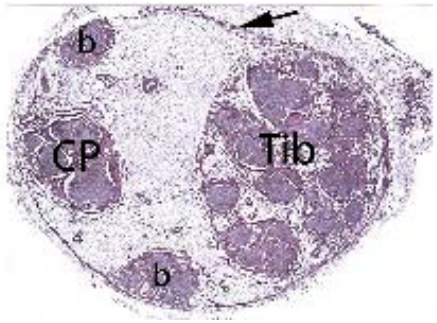
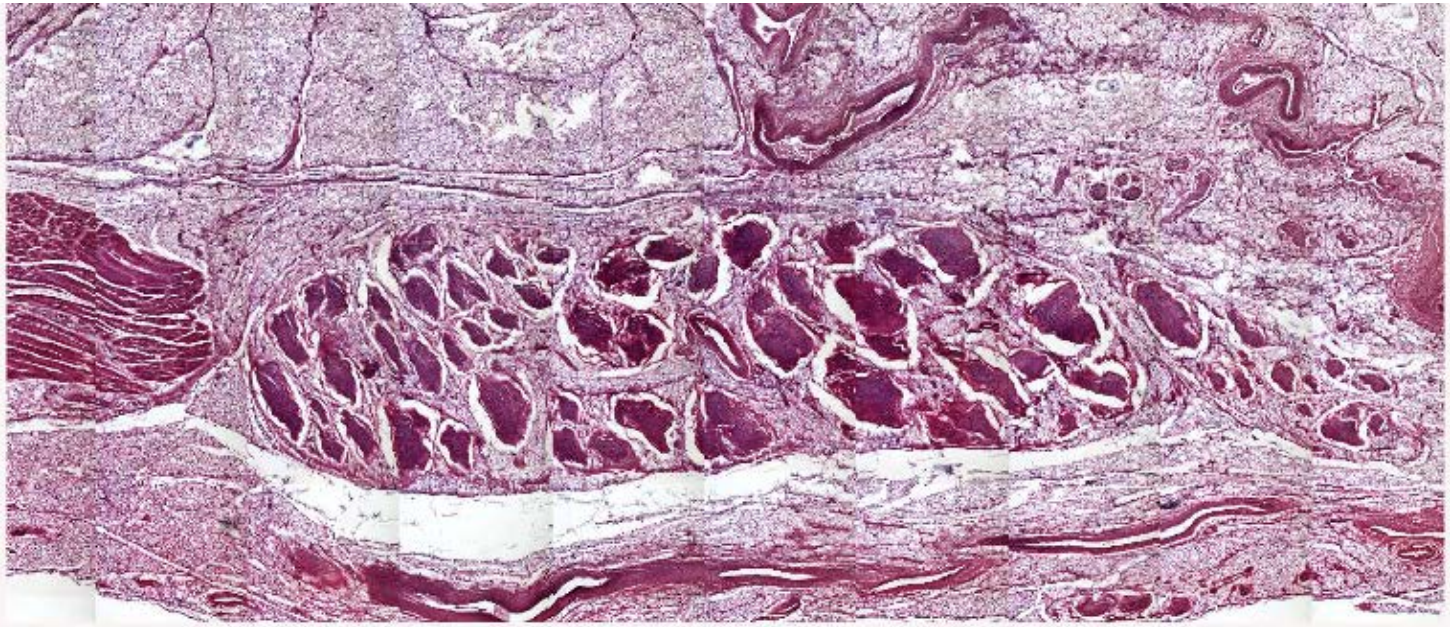


FIGURE 2. The extraneural common layers of connective tissue surrounding the sciatic nerve at midthigh have been sectioned to show the underlying tibial and common peroneal nerves surrounded by their own epineurium. Dissection by Dr. Franco on a preserved cadaver.

4st step nerve protection:

Attachment to adjacent structures

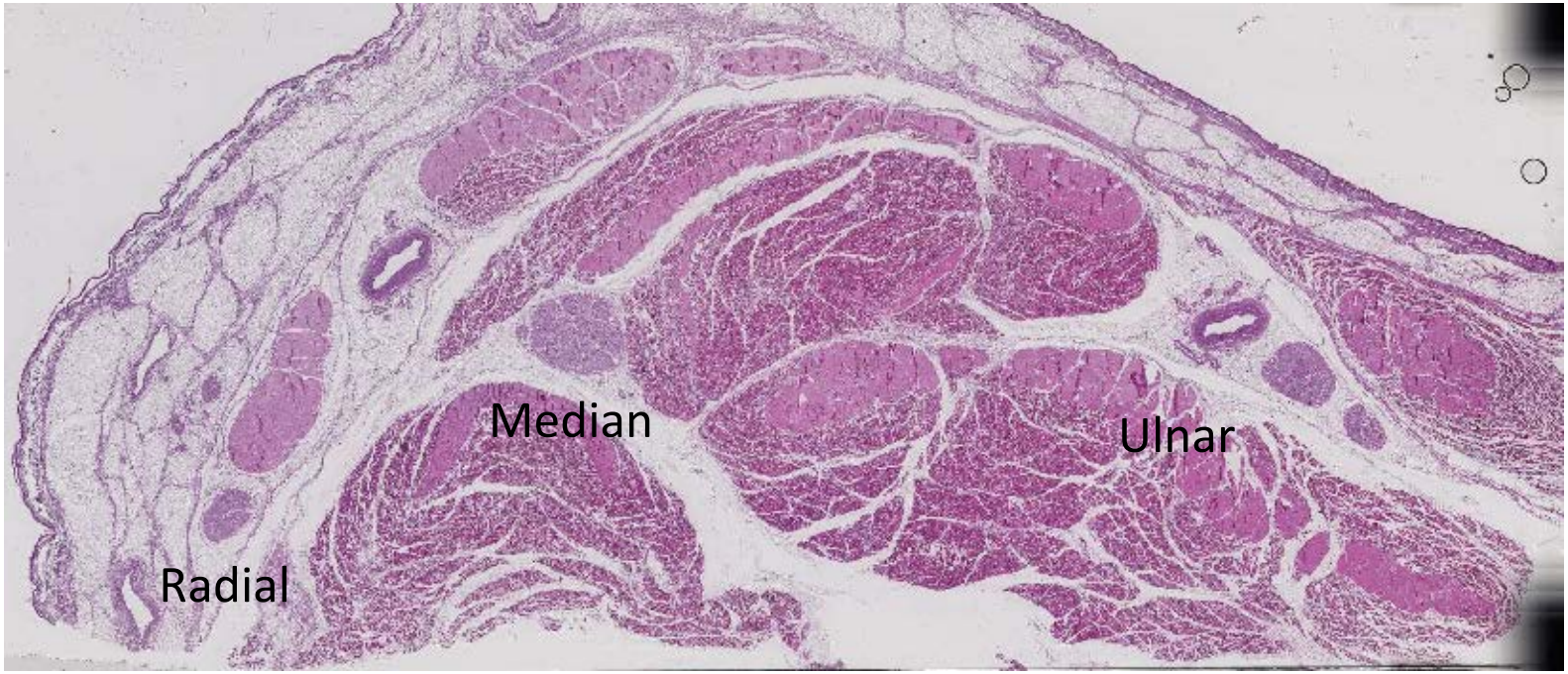
Muscles, tendoms, arteries, bone, ligaments....



4st step nerve protection:

Attachment to adjacent structures

Muscles, tendoms, arteries, bone, ligaments....



- SOME DEMOSTRATIVE VIDEOS:
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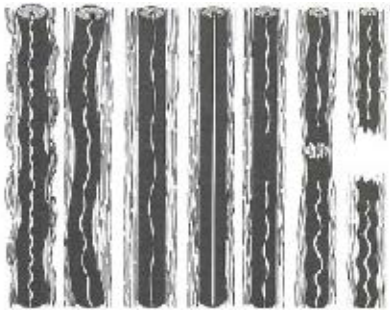
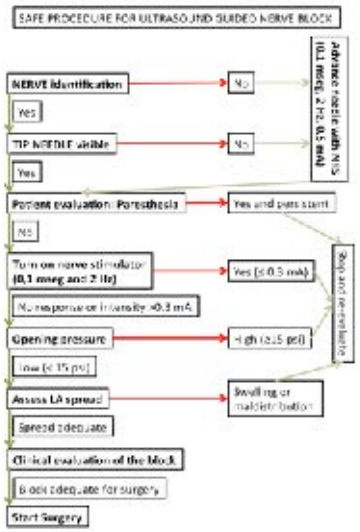
  - INTRANEURAL VS EXTRANEURAL NEEDLE
- SAFETY ALGORITHM FO US-GUIDED NERVE BLOCK
- NERVE AUTOPROTECTION.
  - MACRO AND MICROANATOMY OF NERVES
  - A COMMON SENSE “POINT OF VIEW”

- CONCLUSIONS and Educational objectives:
  - Nerve are organized to protect themselves
    - Nerve autoprotection and nerve pathology
  - The blockade is always an injury for the nerve
    - Needs more than the morphological (ultrasound) point of view (functional and physics)
  - The anesthesiologist (Surgeron) is the responsible of the Block
    - Safety depends of the technician (knowledge and Experience)





conclusiones

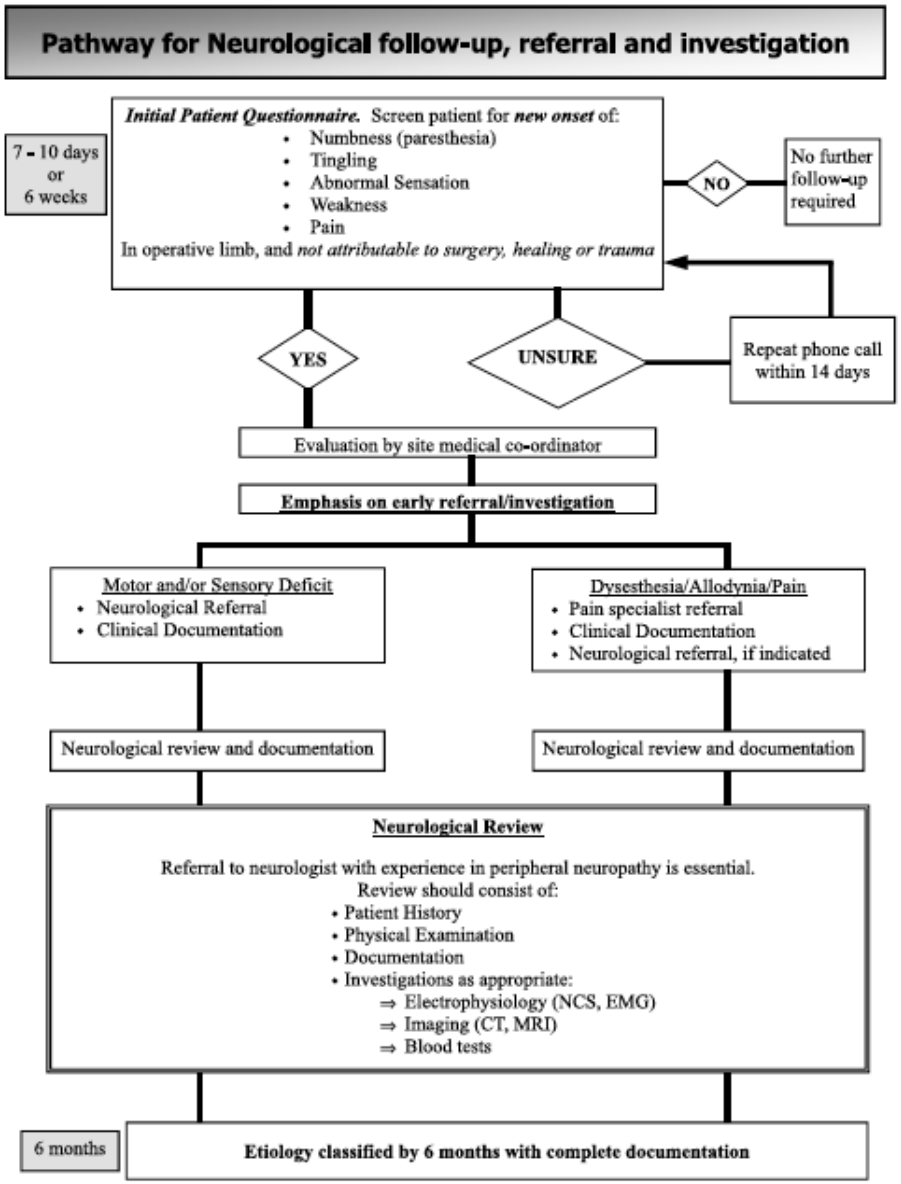
1. Aguja intraneural ≠ Lesión nerviosa
2. Mecanismos de seguridad ≠ Obligatoriedad empleo
3. LESION NERVIOSA ≠ BLOQUEO INSEGURO

Societat Catalana d'Anestesiologia, Reanimació i Terapèutica del Dolor

Preliminary Results of the Australasian Regional Anaesthesia Collaboration

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

(*Reg Anesth Pain Med* 2009;34: 534–541)



Societat Catalana d'Anestesiologia, Reanimació i Terapèutica del Dolor

01-04-2019 | 19:30 - 22:00 | Sala 8

19:30 - 21:30 **Dolor derivat de les complicacions neurològiques de l'anestèsia regional** (Sessió)
Moderador/a: Dr. Luis Lorente Caparros. *Hospital Universitari General de Catalunya, Sant Cugat del Vallès*

- Revisió de las complicacions neurològiques en anestèsia locoregional i dolor
  Ponent: Dra. Marta Ferrándiz Mach. *Hospital de la Santa Creu i Sant Pau, Barcelona*
- Neuropatia post bloqueig, prevenir és millor que curar
  Ponent: Dr. Xavier Sala Blanch. *Hospital Clínic, Barcelona*
- Malposicions quirúrgiques i lesions nervioses
  Ponent: Dr. Jose Antonio Fernández Núñez. *Hospital de la Santa Creu i Sant Pau, Barcelona*

Neuropatia post-bloqueig: Prevenir és millor que tractar.

Gràcies

Xavier Sala-Blanch

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