

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO
CENTRO DE CIÊNCIAS DA SAÚDE
INSTITUTO DE BIOFÍSICA CARLOS CHAGAS FILHO

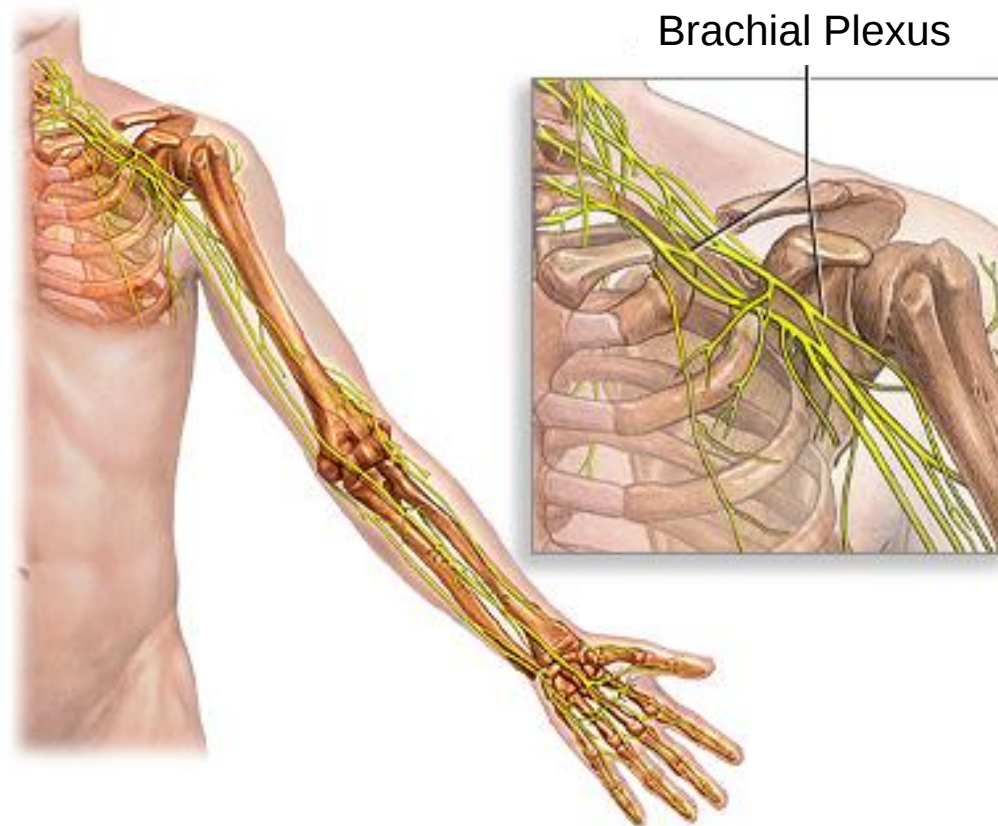
INVESTIGATION OF TOUCH THRESHOLD AND REFERRED SENSATION IN BRACHIAL PLEXUS INJURIES

Bia Ramalho dos Santos Lima

Laboratório de Neurobiologia II

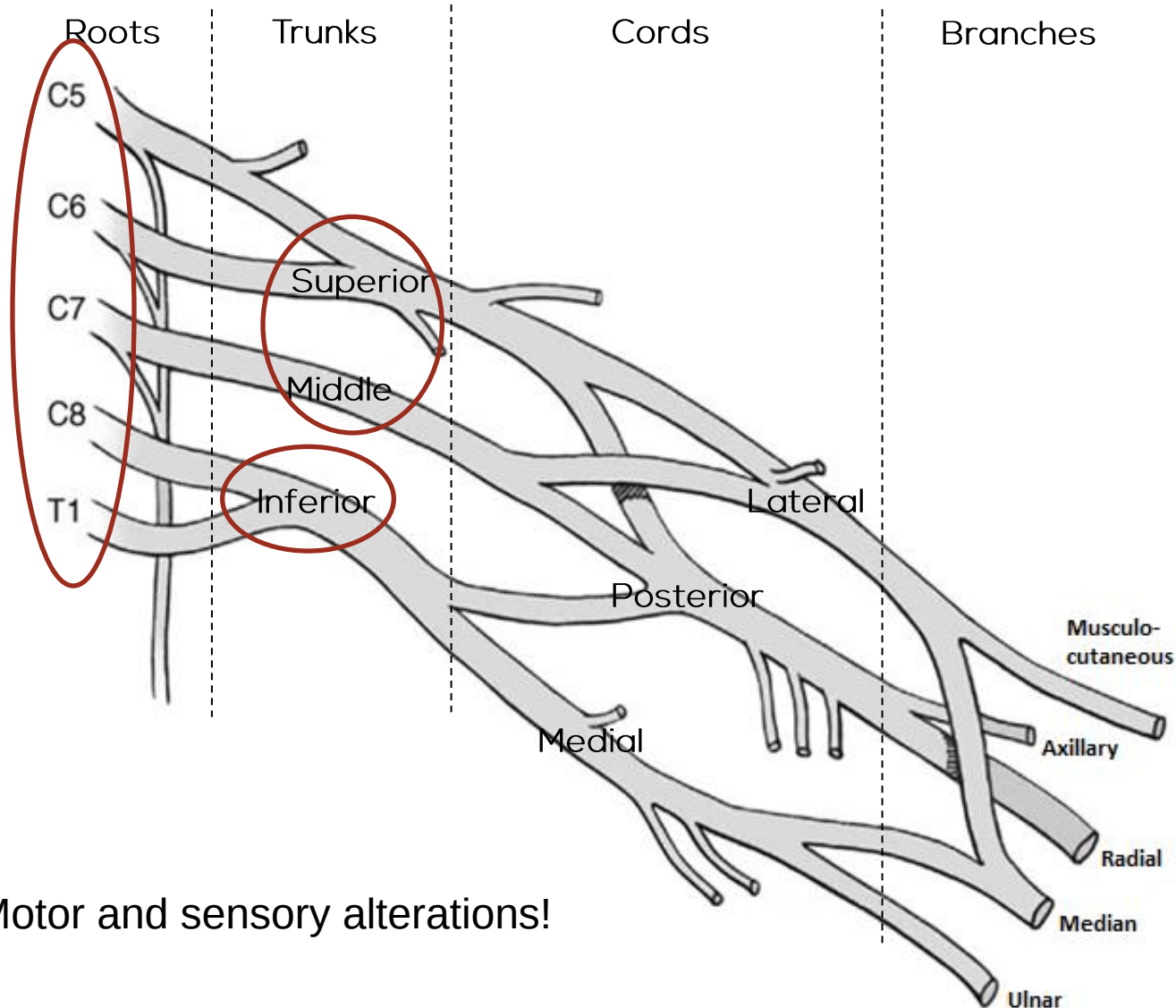
Supervisors: Claudia Domingues Vargas e Fátima Smith Erthal

BRACHIAL PLEXUS



BRACHIAL PLEXUS

Injuries
can
affect...



Superior Trunk (ST):

Innervation of the skin over the deltoid and the lateral forearm, thumb and index finger

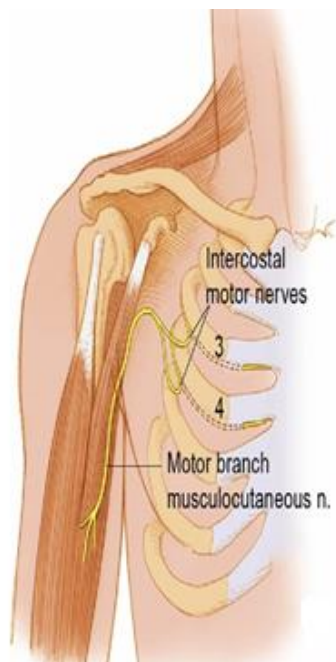
Middle Trunk (MT):

Middle finger innervation

Inferior Trunk (IT):

Innervation of the 4th and 5th fingers and the medial forearm's skin

SURGICAL REPAIRS



Intercostal Nerve to Musculocutaneous Nerve (Int-Musc)

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Neurolysis
Sutures
Grafts
Tubulizations
Nerve transfers



PATIENTS

- 9 of 15 patients fulfilled the inclusion and exclusion criteria;
- The median age was 32 years, with maximum and minimum being 38 and 24 years;
- 8 male and 1 female;
- Different injuries - affecting only one trunk or all of them with different degrees of severity (ex.: avulsions or neuropraxis);
- Different surgical repairs - one or more (ex.: grafts and nerve transfers)*;
- Median time between injury and surgery was 6 months, with maximum and minimum being 12 and 4 months;
- 9 healthy controls were matched in sex and age .

* one patient had not undergone surgery yet.

ASSESSED POINTS

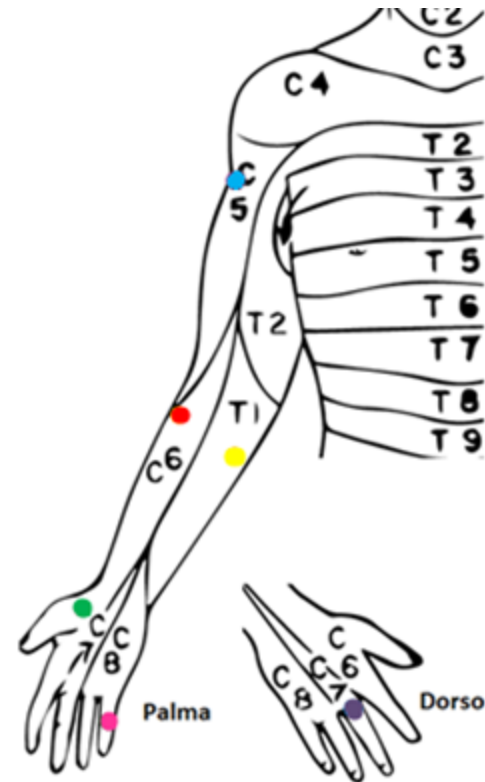
Points of **E**xclusive **I**nnervations
(**PEIs**)

=

Autonomous Zones

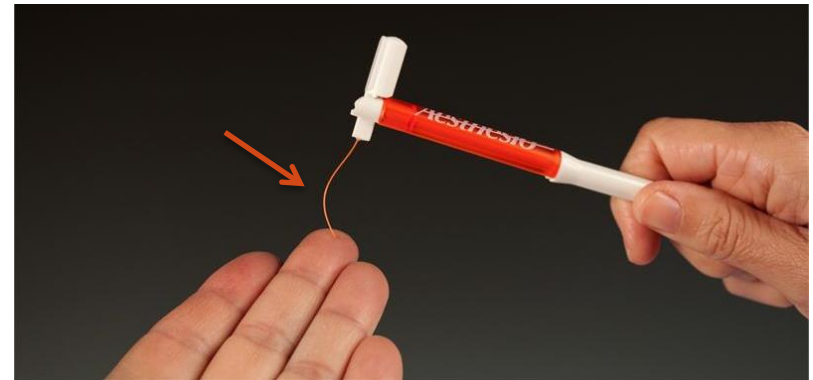
+

Dermatomes



- Axillary Nerve (C5);
- Musculocutaneous Nerve (C6);
- Median Nerve (C6);
- Radial Nerve (C7);
- Ulnar Nerve (C8);
- Brachial Plexus Nerve (T1).

SEMMES-WEINSTEIN MONOFILAMENTS



Default Number	1,65	2,36	2,44	2,83	3,22	3,61	3,84	4,08	4,17	4,31	4,56	4,74	4,93	5,07	5,18	5,46	5,88	6,10	6,45	6,65
Force(g)	0,008	0,02	0,04	0,07	0,16	0,4	0,6	1	1,4	2	4	6	8	10	15	26	60	100	180	300
Used Number	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

SENSIBILITY ASSESSMENT

TOUCH THRESHOLD

Filament Number	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0 (anesthesia)
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Until to feel 3 of 5 stimuli

■ What did you feel?

☐ Could be more than one sensation

THRESHOLD

■ Where did you feel?

☐ Could be in more than one site.

20

Filament #

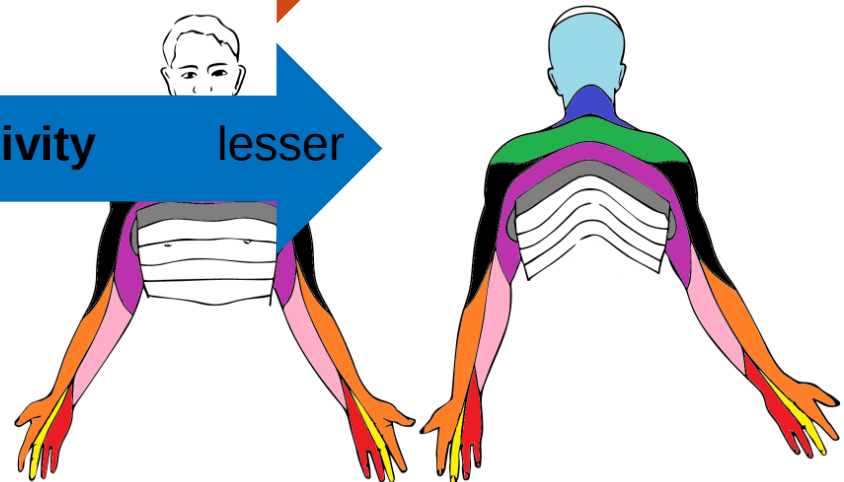
0

Sensations	
Movement	Shock
Touch	Burning
Pressure	Heat
Grasp	Cold
Sting	Tickle
Vibration	Sweat
Formication	

greater

Sensitivity

lesser



(PIMENTEL e col., 2006; SOUZA., 2014)

EXPERIMENTAL SETUP

A.



B.

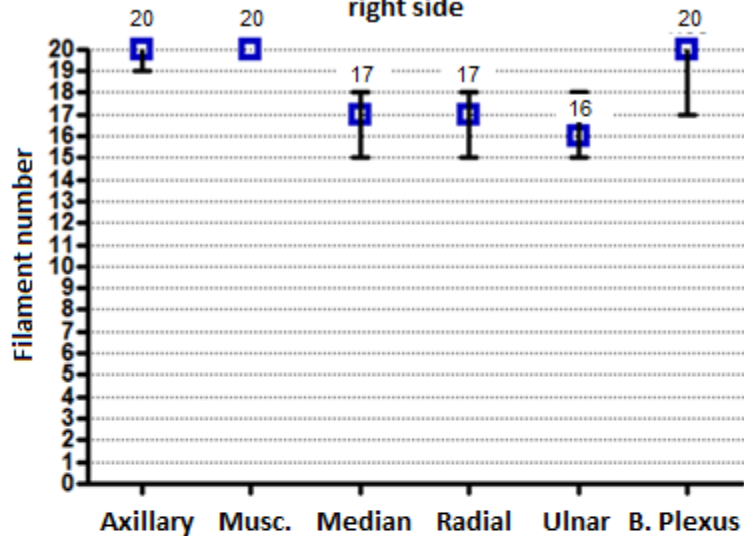




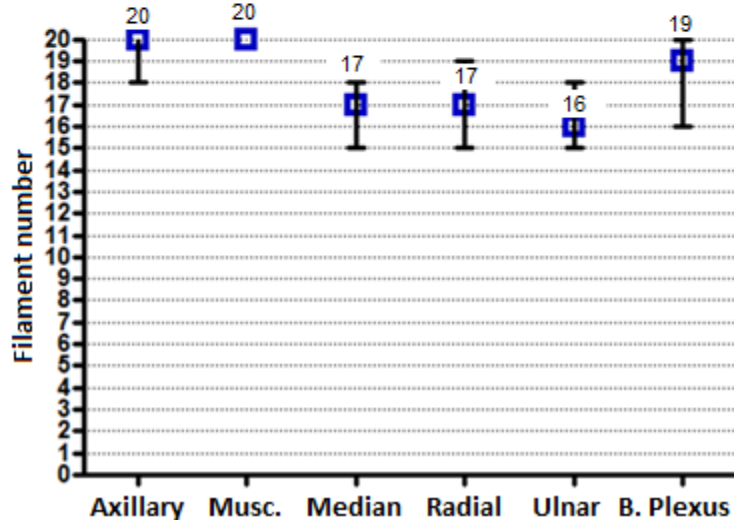
TOUCH THRESHOLD

Controls

A. Thresholds values Median (max. and min.) per point-right side

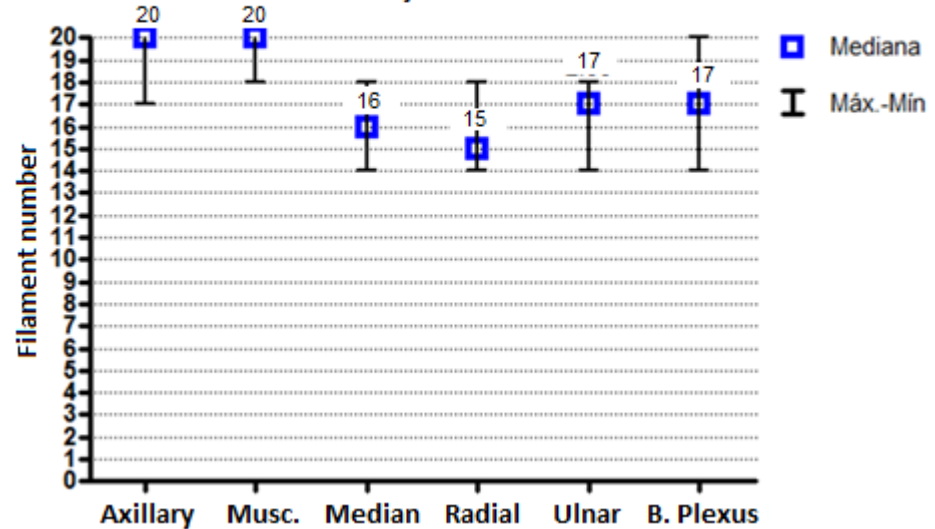


B. Thresholds values Median (max. and min.) per point-left side

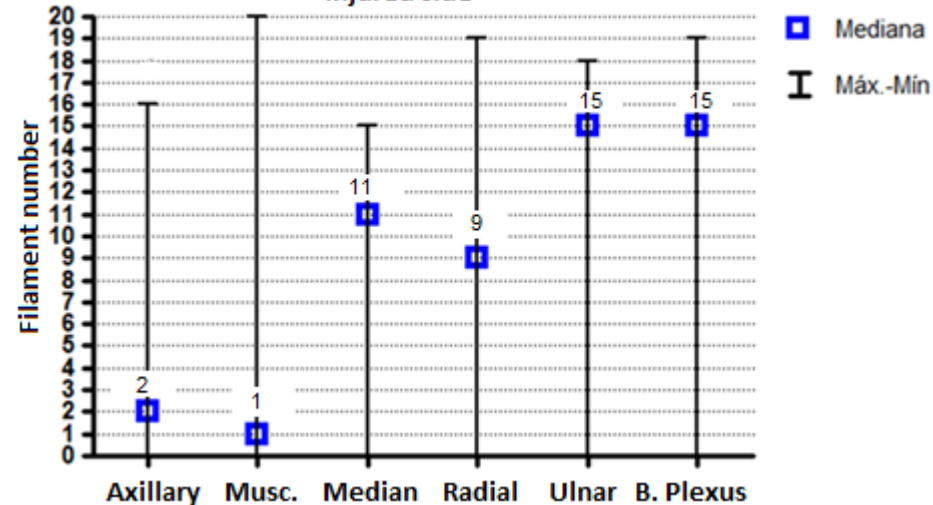


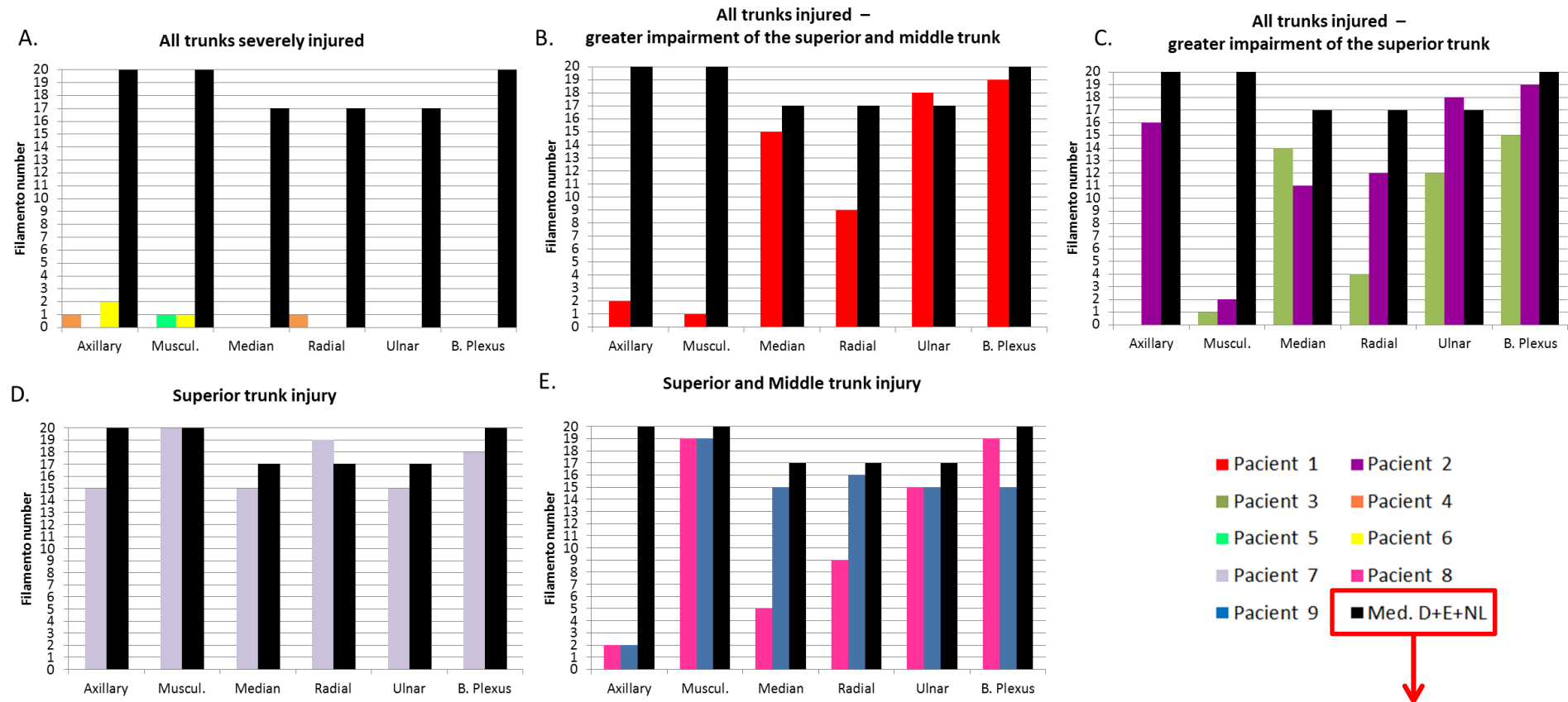
Patients

C. Thresholds values Median (max. and min.) per point-uninjured side



D. Thresholds values Median (max. and min.) per point-injured side



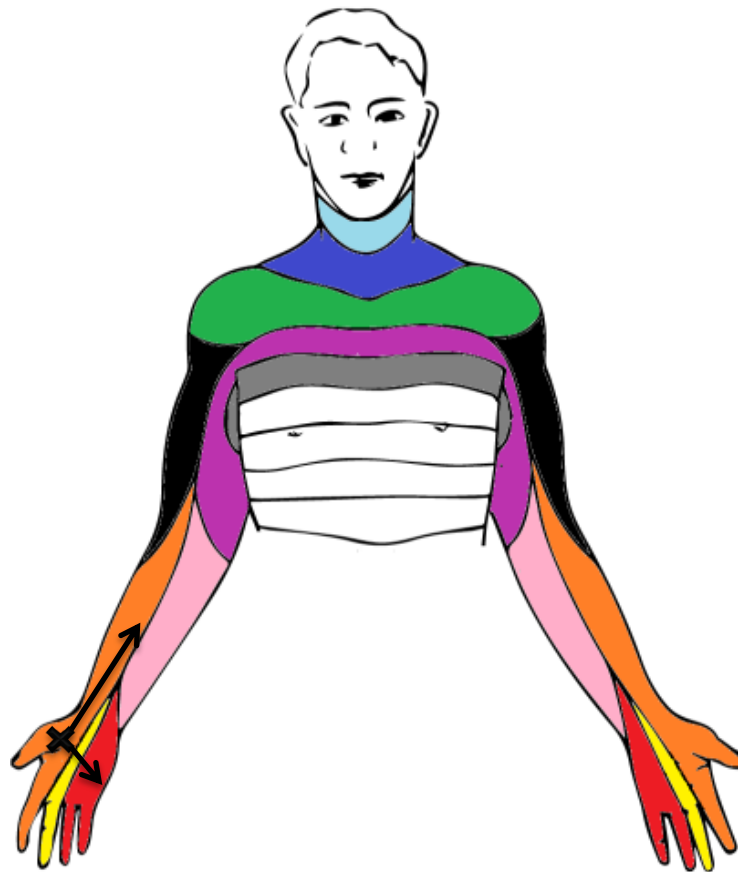


Median from right and left sides (controls) and uninjured side (patients)

REFERRED SENSATION –

sensation felt in one or more places other than the stimulated site

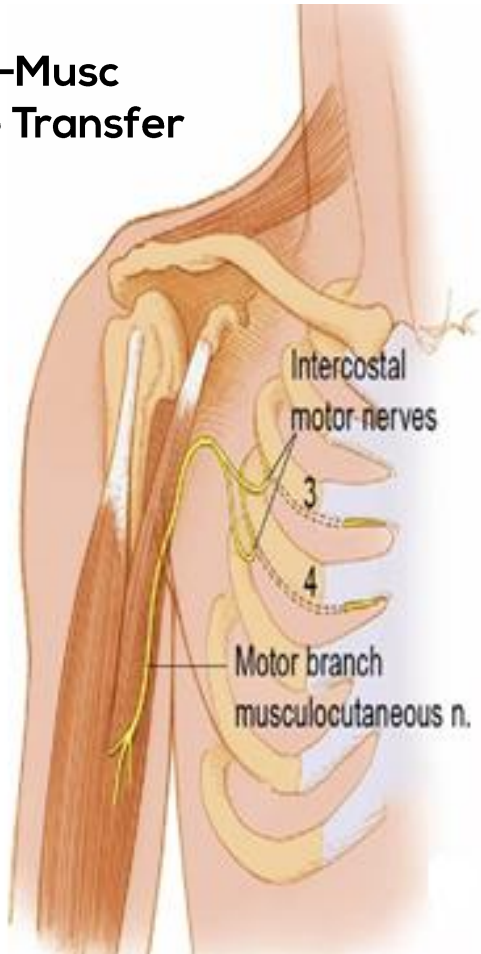
- Information collected during touch threshold determination.



INTERCOSTAL NERVE TRANSFER

Hideo Kawai

Int-Musc
Nerve Transfer

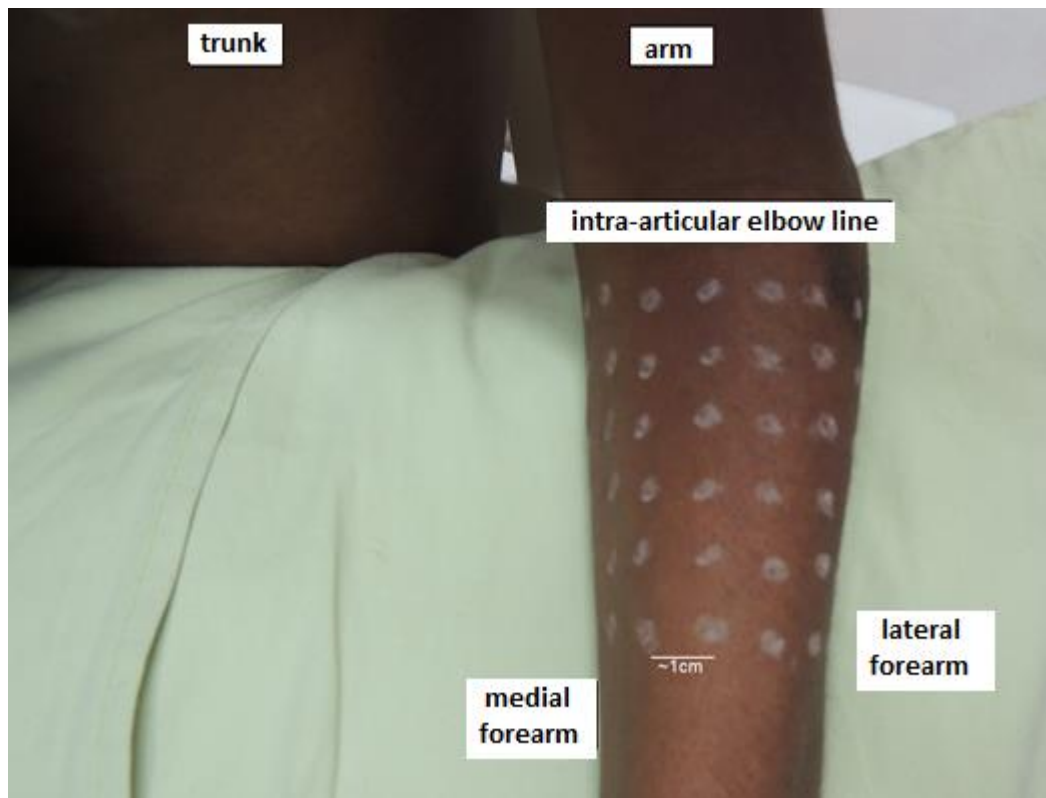


(MALESSY et al., 1998; KAWAI, 2000)

REFERRED SENSATION AFTER INT-MUSC TRANSFER

Thickest
filament ↓

Used Number	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0 (anesthesia)
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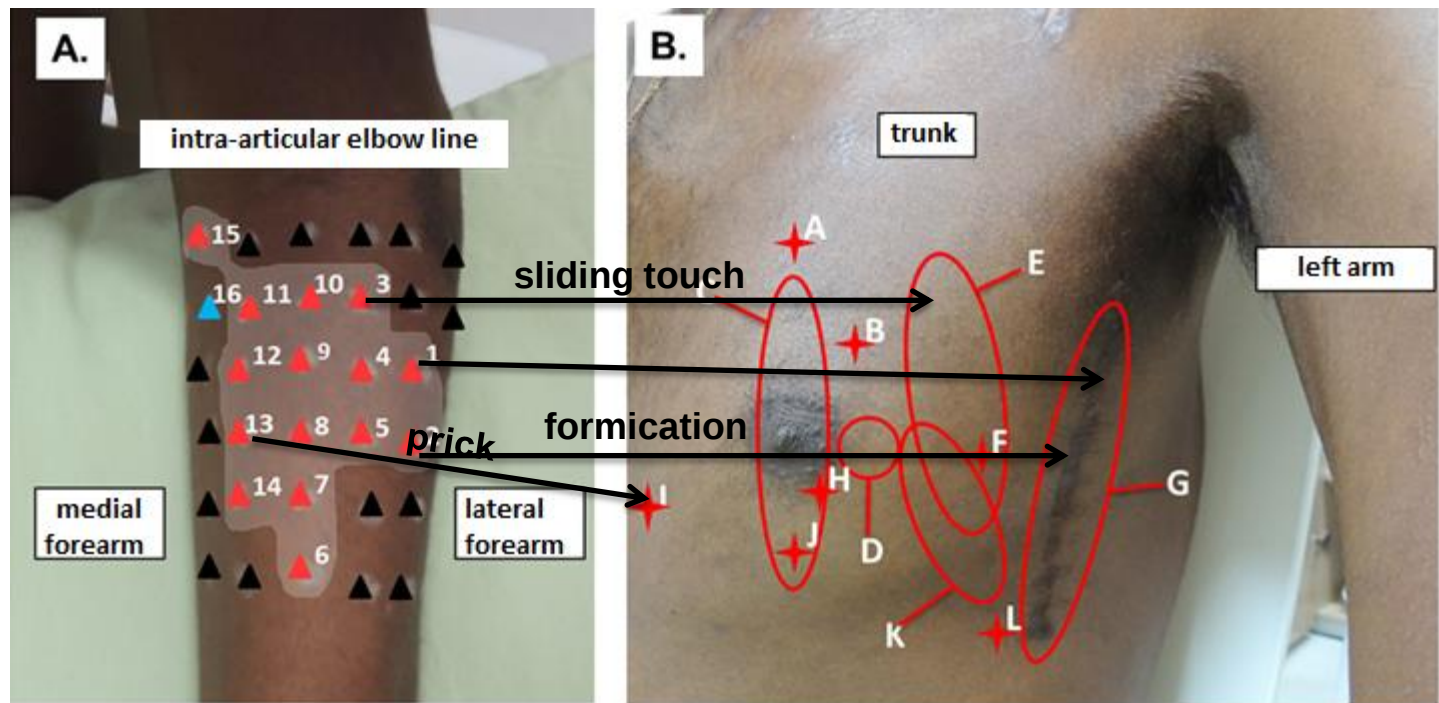
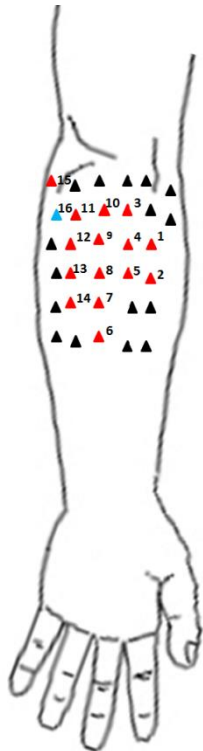
Patient 4

Patient 4 History

- Serious injury of all trunks of the brachial plexus;
- Undergone intercostal to musculocutaneous and accessory to suprascapular nerve transfers;
- Time between injury and surgery = 3 months;
- Time between surgery and the exam = 22 months;
- Sensitivity: capacity to feel only the filament # 1 in the axillary and radial PEIs.

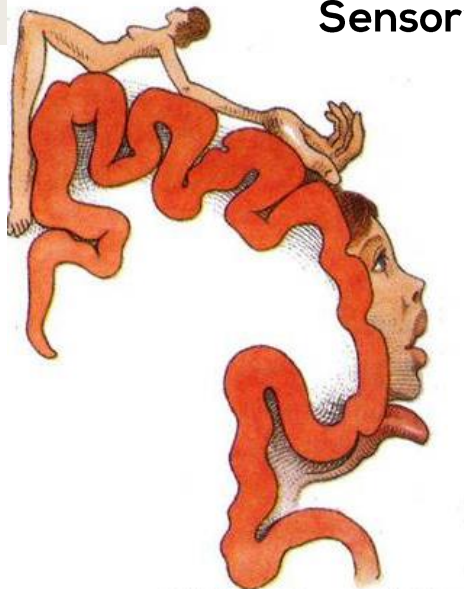
Legend

- ▲ - Sensation in the stimulation site (forearm);
- ▲ - Referred sensation in the trunk;
- ▲ - Anesthesia;
- ★ - Prick sensation.



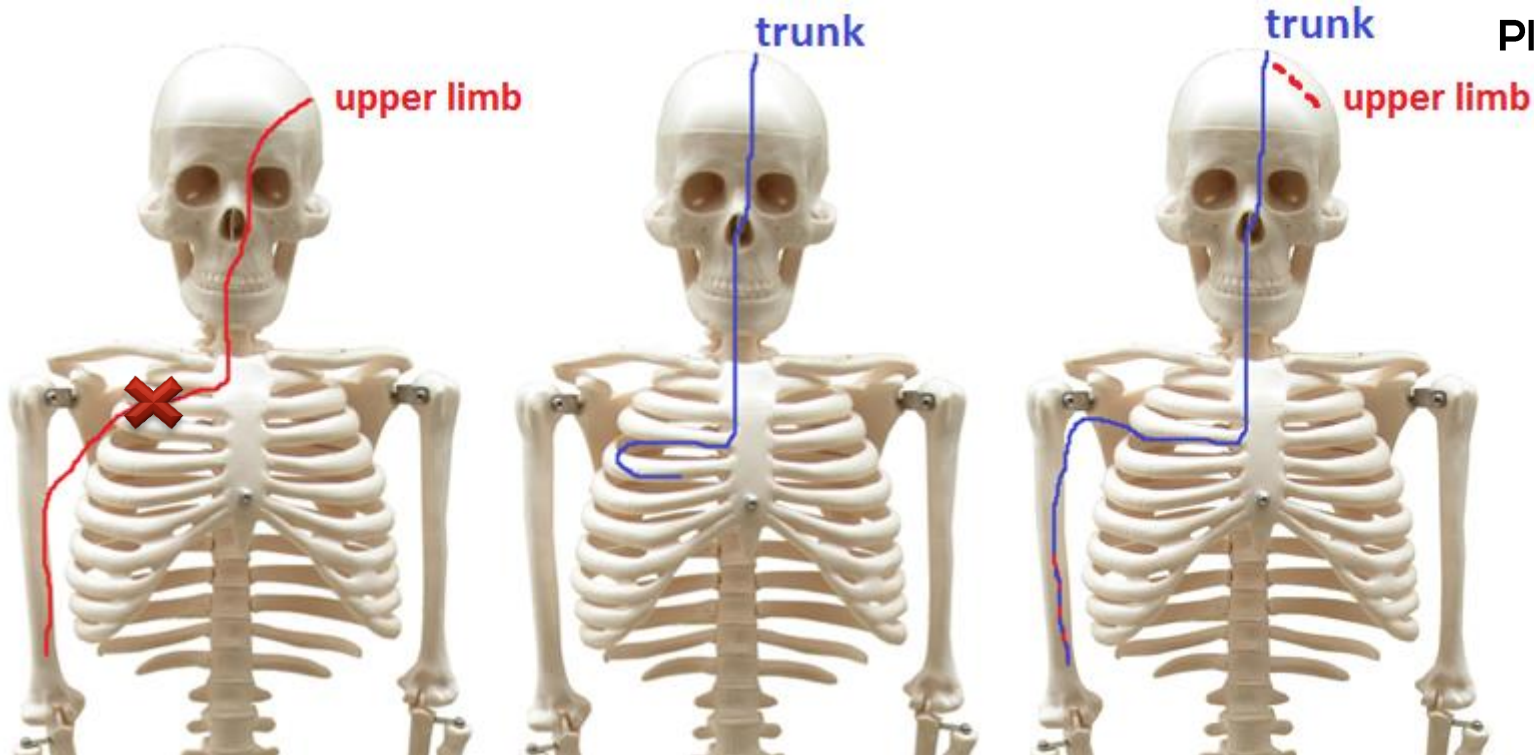
Extent of reinnervation ~ 5 cm

Sensory Cortex



Int-Musc Nerve Transfer

Plasticity



THANKS!

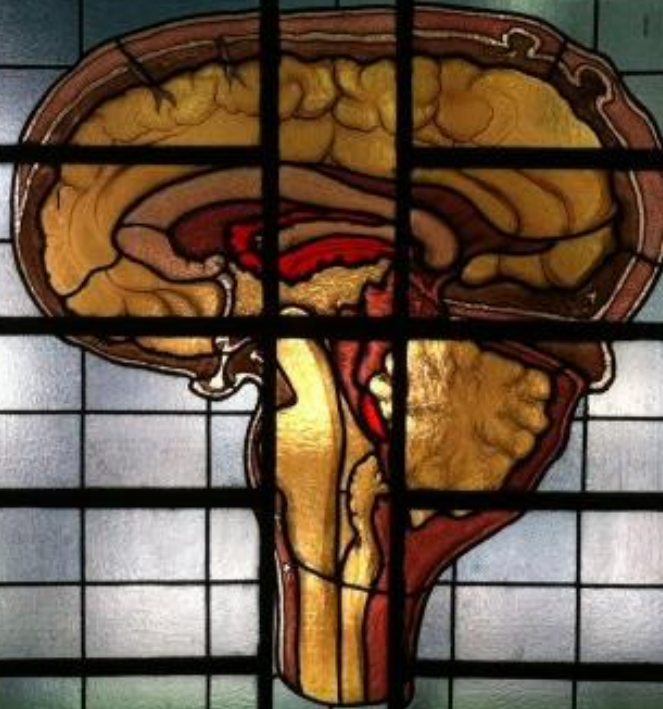
*Laboratório de
Neurobiologia II*

*Clinical Team
(INDC)*

Volunteers

Claudia Vargas

Fátima Erthal



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