Title: **Hybrid fluoroscopy and ultrasonography technique with Curved Needle (F/US-CN) for thoracic dorsal root ganglion approach (T-DRG)**

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Institutional Ethics and Informed Consent Criteria prior to block and RF satisfied in every case.

Objetives:

The (F/US-CN) Technique is advocated for T-DRG intervention in order to avoid pleural puncture, injury of other deeper spinal structures and facilitating navigation with curve needle to the medial and cephalic T-DRG from the needle entry point. The technique is intended to overcome issues and reduce exposure to ionizing radiation.

Methods:

After testing with the Hybrid Cadaveric/Synthetic Simulator (1) (Fig. 1 – 4) in 11 patients with thoracic neuropathic pain, treatment with pulsed and thermal RF was provided. With a convex transducer in a transverse incidence In Plane at the level of the transverse process, moving the transducer in caudal direction until identifying the most external, caudal and lateral point of the lamina and from there aiming the OBLIQUE transducer in line to the theoretical T-DRG site in order to define the needle entry site. With the needle aiming to lateral the border of the lamina is surpassed. Then, the tip of the curve needle is rotated to medial and cephalic in order to navigate to reach the superficial target. This is confirmed by fluoroscopy under AP and lateral visualization. Fig 5-8

Results:

Table 1 provides details of the successful T-DRG approach with F/US-CN. Sensory and motor stimuli were assessed to confirm the needle site. The target was identified with a low number of X Rays shots per level without pleural or other structures punctures. In first and complex cases (scoliosis, kyphosis) localization shots were used as recorded in Table 1.

Conclusions:

This Hybrid Procedure F/US-CN is an effective method to approach T-DRG as proven by RF sensitive and motor stimulation; it is also safe as it helps to avoid pleural and spinal structures puncture and to reduce exposure to ionizing radiation.



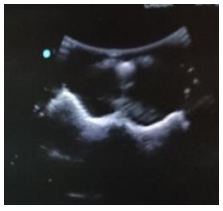
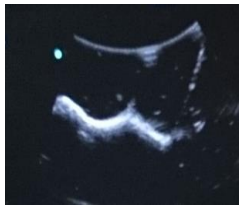

Fig 1. Arrow pointing out the point to start on the human spine; Fig 2. With New hybrid simulator testing the combined US/Fluoro procedure (Rev. Soc. Española del Dolor). Fig 3. With Simulador US images show a cut on transverse process; Fig 4. Cut on the lamina border little oblique with needle close to surpassed.



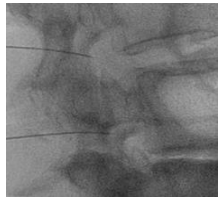


Fig 5. US on transverse process. Look pleura ; Fig 6. US on the lamina with the needle deeper to lateral border; Fig 7. Fluoroscopy with Needle on DRG lateral; Fig 8. Fluoroscopy with Needle on DRG PA view

Age (years)	Sex	Weight (Kg)	Diagnosis	Level of block	Level of block	Sensitive / motor stimulation	N° of LFS	N° CFS per level
56	F	89	PHN	T 5-T7	T 5-T7	OK	1	3
63	M	58	PHN	T4-T5	T4-T5	OK	-	2
72	F	70	PHN	T9-T11	T9-T11	OK	2	3
35	M	68	PHN	T8-T10	T8-T10	OK	2	4
63	M	116	Lung CA CPSP	T3-T9	T3-T9	OK	-	4
45	F	76	PHN	T11 - T12	T11-T12	OK	-	5
70	F	73	PHN	T10 -12	T10-12	OK	2	5
57	F	91	PHN	T6-T8	T6-T8	OK	3	3
52	M	92	Emphysema surgery CPSP	T4-T8	T4-T8	OK	-	5
58	F	69	Lung CA CPSP	T7-L2	T7-L2	OK	2	4
92	F	56	PHN	T4-T8	T3-T6	OK	3	5

Table 1. 11 patients **Blocking T-DRG with F/US-CN**. F: Female; M: Male; PHN: post herpetic neuropathy; CPSP: chronic postsurgical pain; LFS: localization fluoroscopy shots; CFS: corroboration fluoroscopy shots

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