

Peripheral Nerve Block Needle Tip Localisation Under Ultrasound – Blinded Assessment Of Five Different Needles In Human Fresh Cadaveric Tissue

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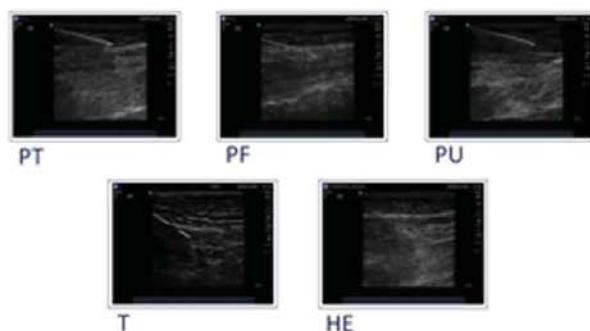


Introduction: Accurate needle tip identification minimises damage to nearby structures and optimises drug placement. Studies of regional anaesthesia needles have assessed visibility in water baths or gel phantoms but not human tissue. A novel strategy is used to investigate clinicians' accuracy at identifying needle tips on static cadaveric images.

Methods: Five peripheral block needles were studied including a new echogenic needle designed by one of our ANZCA trainees (T). Multiple images were taken of each needle at shallow (15-25°), moderate (35-45°) and steep (55-65°) insertion angles using a Sonosite M-Turbo and variable angle needle guide. Ten anaesthetists experienced in ultrasound guided blocks were asked to identify needle tip position on each of the 45 static images and to state their confidence level in their estimates ('not', 'moderately' and 'very' confident). True tip position was determined at the time of image generation using dynamic studies but concealed from the anaesthetists. Distances between estimated and true positions were measured.

The characteristics of the five needles studied are summarised below with example images:

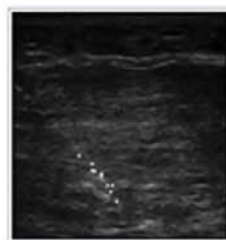
Needle	Size	Tip	Features
Pajunk Uniplex Nanoline (PF)	20G	Facet	Standard used at study centre for single shot blocks
Pajunk PlexoLong Nanoline (PT)	18G	Tuohy	Standard used at study centre for catheter placement
Polymedic Ultrasound (PU)	20G	Facet	Echogenic coating last 2cm of needle shaft
Hakko Echostim (HE)	21G	Facet	Three "corner cube reflectors" distal needle shaft
New design (T)	20G	Facet	Modified Pajunk needle with textured shaft then 0.5cm gap before 0.5cm textured tip



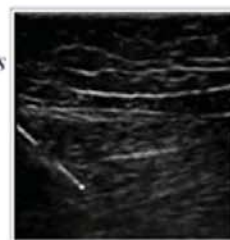
Results: All anaesthetists completed the study. In nine out of 450 estimates the tip marker was left in default position as the assessor had no idea where to place it and stated the pointer was already in their "best guess" position. In these cases, distance between default position (top right of the image) and true tip position was used.

Median distance between estimates and true tip position in mm (interquartile range)

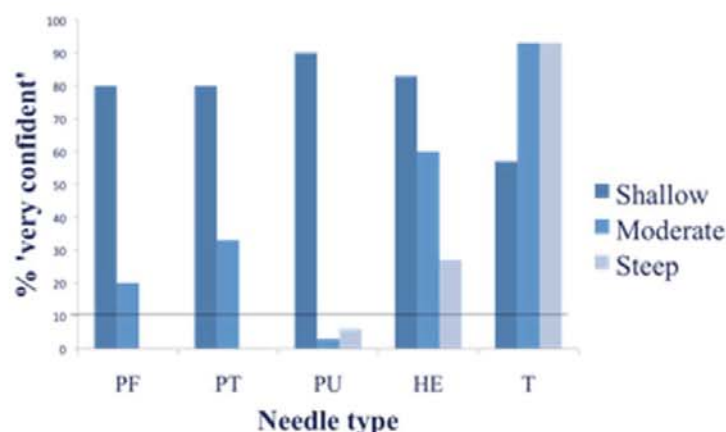
		Needle type				
		PF	PT	PU	HE	T
Insertion angle	Shallow	0.5 (0.5-0.8)	0.8 (0.5-1.0)	0.5 (0.5-0.8)	0.5 (0.3-0.5)	0.5 (0.3-0.8)
	Moderate	0.5 (0.5-0.9)	0.5 (0.3-1.0)	2.5 (0.8-7.0)	0.5 (0.3-0.8)	0.5 (0.3-0.8)
	Steep	1.0 (0.5-3.9)	5.3 (2.5-11)	1.3 (0.8-3.7)	0.8 (0.5-1.0)	0.5 (0.3-0.7)



Images showing aggregated estimates for two different needles at steep insertion angles



Confidence of anaesthetists in their estimates of needle tip position



Conclusions: Accuracy of tip identification was similar with all needles at shallow insertion angles. At steep insertion angles, HE and T were more accurately identified. Confidence reduced at steeper angles except for needle T where confidence increased. Needles T and HE may be preferable with regard to tip identification, particularly where the insertion angle is steep.