“The primary objective of this review was to evaluate the effectiveness and safety of two-dimensional ultrasound (US)- or Doppler ultrasound (USD)-guided puncture techniques for subclavian vein, axillary vein and femoral vein puncture during central venous catheter insertion in adults and children” Brass et al (2015).

Reference:

Brass, P., Hellmich, M., Kolodziej, L., Schick, G. and Smith, A.F. (2015) Ultrasound guidance versus anatomical landmarks for subclavian or femoral vein catheterization. The Cochrane Database of Systematic Reviews. CD011447. .

Systematic review: Ultrasound guidance for subclavian or femoral vein catheterization http://ctt.ec/7rFNa+ @ivteam #ivteam

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Abstract:

BACKGROUND: Central venous catheters can help with diagnosis and treatment of the critically ill. The catheter may be placed in a large vein in the neck (internal jugular vein), upper chest (subclavian vein) or groin (femoral vein). Whilst this is beneficial overall, inserting the catheter risks arterial puncture and other complications and should be performed in as few attempts as possible.In the past, anatomical ‘landmarks’ on the body surface were used to find the correct place to insert these catheters, but ultrasound imaging

is now available. A Doppler mode is sometimes used to supplement plain ‘two-dimensional’ ultrasound.

OBJECTIVES: The primary objective of this review was to evaluate the effectiveness and safety of two-dimensional ultrasound (US)- or Doppler ultrasound (USD)-guided puncture techniques for subclavian vein, axillary vein and femoral vein puncture during central venous catheter insertion in adults and children. We assessed whether there was a difference in complication rates between traditional landmark-guided and any ultrasound-guided central vein puncture.When possible, we also assessed the following secondary objectives: whether a possible difference could be verified with use of the US technique versus the USD technique; whether there was a difference between using ultrasound throughout the puncture (‘direct’) and using it only to identify and mark the vein before starting the puncture procedure (‘indirect’); and whether these possible differences might be evident in different groups of patients or with different levels of experience among those inserting the catheters.

SEARCH METHODS: We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (2013, Issue 1), MEDLINE (1966 to 15 January 2013), EMBASE (1966 to 15 January 2013), the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982 to 15 January 2013), reference lists of articles, ‘grey literature’ and dissertations. An additional handsearch focused on intensive care and anaesthesia journals and abstracts and proceedings of scientific meetings. We attempted to identify unpublished or ongoing studies by contacting companies and experts in the field, and we searched trial registers. We reran the search in August 2014. We will deal with any studies of interest when we update the review.

SELECTION CRITERIA: Randomized and quasi-randomized controlled trials comparing two-dimensional ultrasound or Doppler ultrasound versus an anatomical ‘landmark’ technique during insertion of subclavian or femoral venous catheters in both adults and children.

DATA COLLECTION AND ANALYSIS: Three review authors independently extracted data on methodological quality, participants, interventions and outcomes of interest using a standardized form. We performed a priori subgroup analyses.

MAIN RESULTS: Altogether 13 studies enrolling 2341 participants (and involving 2360

procedures) fulfilled the inclusion criteria. The quality of evidence was very low (subclavian vein N = 3) or low (subclavian vein N = 4, femoral vein N = 2) for most outcomes, moderate for one outcome (femoral vein) and high at best for two outcomes (subclavian vein N = 1, femoral vein N = 1). Most of the trials had unclear risk of bias across the six domains, and heterogeneity among the studies was significant.For the subclavian vein (nine studies, 2030 participants, 2049 procedures), two-dimensional ultrasound reduced the risk of inadvertent arterial puncture (three trials, 498 participants, risk ratio (RR) 0.21, 95% confidence interval (CI) 0.06 to 0.82; P value 0.02, I^2 = 0%) and haematoma formation (three trials, 498 participants, RR 0.26, 95% CI 0.09 to 0.76; P value 0.01, I^2 = 0%). No evidence was found of a difference in total or other complications (together, US, USD), overall (together, US, USD), number of attempts until success (US) or first-time (US) success rates or time taken to insert the catheter (US).For the femoral vein, fewer data were available for analysis (four studies, 311 participants, 311 procedures). No evidence was found of a difference in inadvertent arterial puncture or other complications. However, success on the first attempt was more likely with ultrasound (three trials, 224 participants, RR 1.73, 95% CI 1.34 to 2.22; P value < 0.0001, I^2 = 31%), and a small increase in the overall success rate was noted (RR 1.11, 95% CI 1.00 to 1.23; P value 0.06, I^2 = 50%). No data on mortality or participant-reported outcomes were provided.

AUTHORS' CONCLUSIONS: On the basis of available data, we conclude that two-dimensional ultrasound offers small gains in safety and quality when compared with an anatomical landmark technique for subclavian (arterial puncture, haematoma formation) or femoral vein (success on the first attempt) cannulation for central vein catheterization. Data on insertion by inexperienced or experienced users, or on patients at high risk for complications, are lacking. The results for Doppler ultrasound techniques versus anatomical landmark techniques are uncertain.

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