The Analgesic Effect of Interscalene versus Supraclavicular Plexus Anaesthesia on Postoperative Pain after Shoulder Surgery: A Systematic Review and Meta-analysis

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BACKGROUND

Interscalene plexus blockade is the most common regional anaesthesia technique for alleviating pain after shoulder surgery. However, it is associated with ipsilateral hemidiaphragmatic paresis due to unwanted ipsilateral phrenic nerve block, and with Horner's syndrome and hoarseness. The supraclavicular approach might be an effective alternative with fewer adverse effects.

Objectives: To determine whether there is a difference in postoperative pain scores and morphine equivalents between interscalene and supraclavicular plexus block. Secondary endpoints were serious adverse events, e.g. hemidiaphragmatic paresis and Horner's syndrome.

Design: Systematic review and meta-analysis of randomised controlled trials.

METHODS

A comprehensive literature search of Embase, CENTRAL, MEDLINE and Web of Science yielded 517 studies. Seventeen randomised controlled trials were analysed for eligibility. Eight studies were eventually included in the meta-analysis. The primary endpoints were pain scores until 24 hours after surgery and total morphine equivalents consumed. The secondary endpoints were serious adverse events, e.g. hemidiaphragmatic paresis and Horner's syndrome.

Meta-analysis was performed calculating the weighted mean difference (MD) for comparisons of continuous data. For dichotomous data, meta-analysis was performed calculating the risk ratio (RR). All calculations are stated with the 95% confidence interval (CI). Statistical significance was defined as p -values <0.05 . A random effect model was used for the statistical analysis.

RESULTS

STUDY CHARACTERISTICS

Eight randomized controlled trials met the inclusion criteria and contributed to this meta-analysis (Figure 1). The risk of bias assessment followed the Cochrane Collaboration guidelines (Figure 2). A high risk of bias was given in only 2 of 56 items. The patient characteristics and surgical procedures were comparable between the analysed studies (Table 1).

Table 1. Demographic data														
author (year)	patients characteristics						Characteristics of surgery							
	Cases	Gender		Age (yr)		Weight (kg)		type of surgery			duration of surgery (min)			
		Male	female	Mean	SD	Mean	SD	ASA I/II/III	Arthroscopy	Arthroplasty	Other	mean	SD	
	IC/SC	IC/SC	IC/SC	IC/SC	IC/SC	IC/SC	IC/SC	IC	SC	IC/SC	IC/SC	IC/SC	IC/SC	
Ayoub (2017)*	25/25	7/12	18/13	73/74	7.3/7.3	ns	ns	12/10/4	0/3/2	-	25/25	ns	ns	
Baran (2015)*	19/21	11/8	8/11	37/34	15/14	16/18	16/15	18/2/0	16/4/5	ns	ns	135.5/130.6	24/21	
Kim (2017)	25/24	12/13	13/11	58/64	13/9	65/64	10/11	13/10/2	15/6/3	25/24	0/1	-	108/112	32/34
Koh (2016)	28/27	20/15	18/12	65/62	84/6.8	65/62	11.3/8.5	1/8 ns	-	-	open rotator cuff surgery 38/27	119/47	21/319	
Koibuchi (2017)	25/25	8/9	17/16	49/52	11.2/9.8	ns	ns	13/10/2	12/12/3	25/25	-	-	143/97	29.3/27.1
Lin (2016)	48/38	ns	ns	ns	ns	ns	ns	ns	ns	38/38	-	-	-	-
Pope (2015)	47/46	28/19	19/27	60/59	ns	64/65	100/100	25/22/0	27/19/0	47/46	-	-	84.7/84.5	32.9/29.6
Wiesmann (2016)	16/18	16/22	14/24	13/13	66/66	27/17	1/8 ns	16/18	56/58	-	-	-	-	-

PAIN SCORES (at PACU)

Four studies reported pain scores at the PACU. The random effects model showed that the pain scores between the two techniques did not differ significantly at the PACU (MD 0.22; 95% CI -0.10, 0.53; $p = 0.18$).

PAIN SCORES (at 24h)

Pain scores 24h after surgery were reported by 4 studies. The supraclavicular approach showed lower but overall comparable pain scores (MD -0.51; 95% CI [-1.07 to 0.04], $p=0.07$). The effect did not reach statistical significance.

MORPHINE CONSUMPTION

Five studies reported the total morphine equivalents consumption. The meta-analysis did not reveal a statistically significant difference regarding this endpoint (MD 2.2; 95% CI [0.01 to 4.4], $P=0.05$). The inconsistency regarding this endpoint was very high ($I^2=91\%$).

ADVERSE EVENTS

Secondary endpoint analysis showed a significantly lower rate of hemidiaphragmatic paresis [risk ratio 0.66; 95% CI [0.55 to 0.78], $p<0.00001$] and Horner's syndrome (risk ratio 0.3; 95% CI [0.19 to 0.48], $p<0.001$) in the supraclavicular approach. There was no significant difference in hoarseness (risk ratio 0.62; 95% CI [0.36 to 1.06], $p=0.08$).

CONCLUSIONS

Pain scores at PACU and 24 hours after surgery as well as morphine equivalent consumption were comparable between interscalene and supraclavicular groups showing comparable analgesic efficiency. Despite not reaching statistical significance, any pain score reduction below at least 1.5 points on a 0-10 numerical rating scale is not detectable in clinical practice or can be discriminated subjectively.

Our study confirms the results of prior meta-analyses regarding safety of the two approaches. However, adverse effects were less common with the supraclavicular approach. Thus, the supraclavicular approach is an efficient alternative to the interscalene approach for shoulder surgery and results in lower rates of unwanted adverse effects.

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