

Supplementary table 9. Outcome details for studies on procedural protocols for imaging guided interventions (PICO3)

AUTHOR	STUDY DESIGN	DISEASE	PROCEDURES - SITE	INTERVENTION (COMPOUND)	OUTCOME CATEGORY	OUTCOME DETAIL	OUTCOME EXPLANATION (UNIT) ¹	TIME POINT	RESULTS ²	OVERALL ROB ³
LARGE JOINTS AND PERIARTICULAR STRUCTURES										
Khallaf et al., 2018	RCT	adhesive capsulitis of the shoulder	GH/SASD approach - shoulder	US guided injection (methylprednisolone, lidocaine)	Safety	Pain	Patient Pain VAS	BSL, 12w	no difference	High
					Safety	Pain Function	Shoulder Pain and Disability index	BSL, 12w	12w: better for GH approach	High
					Efficacy	Function	Shoulder flexion ROM (°)	BSL, 12w	no difference	High
					Efficacy	Function	Shoulder abduction ROM (°)	BSL, 12w	no difference	High
					Efficacy	Function	Shoulder extension ROM (°)	BSL, 12w	12w: worse for GH approach	High
					Efficacy	Function	Shoulder internal rotation ROM (°)	BSL, 12w	no differences ⁴	High
					Efficacy	Function	Shoulder external rotation ROM (°)	BSL, 12w	12w: worse for GH approach	High
Cho et al., 2016	RCT	Frozen shoulder	Intrarticular (IA)/ Subacromial bursa (SA) or both (IA+SA) approach	US injection (triamcinolone, lidocaine)	Safety	Pain	Shoulder pain VAS with motion (cm)	BSL, 3w, 6w, 12w	Better for IA and IA+SA compared to SA	Low
					Safety	Symptom severity	Subjective shoulder value (%)	BSL, 3w, 6w, 12w	Better for IA and IA+SA compared to SA	Low
					Efficacy	Function	American Shoulder and Elbow Surgeon score	BSL, 3w, 6w, 12w	Better for IA and IA+SA compared to SA	Low
					Efficacy	Function	Forward flexion ROM (°)	BSL, 3w, 6w, 12w	no difference	Low
					Efficacy	Function	Abduction ROM (°)	BSL, 3w, 6w, 12w	no difference	Low
					Efficacy	Function	External rotation angle ROM (°)	BSL, 3w, 6w, 12w	no difference	Low
					Efficacy	Function	Internal rotation ROM (°)	BSL, 3w, 6w, 12w	Better for IA and IA+SA compared to SA	Low

Chang et al., 2014	RCT	patients with scapular pain	subscapular muscle/ scapulothoracic bursa approach	Subscapular muscle: US guided injection Scapulothoracic bursa: palpation guided injection (triamcinolone, lidocaine)	Safety	Pain	Patient Pain VAS (cm)	BSL, 1w, 2w, 3w (after first injection) 12w (after last injection) ⁵	no difference	Some concerns
					Safety	Adverse events	Complications ⁶ (%)	up to 12w (after last injection) ⁵	no difference	Some concerns
					Efficacy	Treatment response	Rubin Scale	1w (after first injection), 12w (after last injection) ⁵	no difference	Some concerns
Chang et al., 2015	Retrospective cross sectional study	Diskitis osteomyelitis	Bone (Endplate)/Disk or Paravertebral soft tissue - Spine	CT guided Biopsy	Accuracy	Tissue/Fluid acquired	% of true pos findings ⁷	BSL	no difference	7/20
					Accuracy	Tissue/Fluid acquired	Sensitivity/Specificity ⁸	BSL	no difference	7/20
Althoff et al., 2015	Prospective cohort study	Sacroiliitis	intra-/periarticular approach - SIJ	CT guided injection (triamcinolone)	Safety	Pain	Patient Pain VAS pain (cm)	BSL, 1w, 1m, 3m, 6m	3m, 6m: better for intraarticular approach	Serious
Hartung et al., 2010	Prospective cohort study	Acute sacroiliitis	Intra-/periarticular approach - SIJ	US guided injection (triamcinolone, gadolinium)	Safety	Pain	Numerical pain rating scale	BSL, 1d, 4w	no difference	Serious
Jang et al., 2013	RCT	knee joint OA	Out of -/ in plain US - knee	injection (lidocaine, triamcinolone, nonionic contrast agent)	Accuracy	Accuracy	Intra-target verified by contrast medium in joint according to X-ray exam (%)	Post-procedure	no difference	some concern
					Safety	Adverse events	Complications ⁹ (%)	BSL	no difference	some concern
					Cost/Time	Time	skin cleansing to injection (min)	BSL	no difference	some concern
Park et al., 2011	RCT	Knee OA	Medial-/ Midlateral or Superolateral portal - knee	US guided injection (lidocaine, triamcinolone, nonionic contrast agent)	Accuracy	Accuracy	Intra-target verified by contrast medium in suprapatellar pouch or meniscus according to X-ray exam (%)	Post-procedure	no difference	Some concerns
					Safety	Adverse events	Complications ¹⁰ (%)	Up to 4w	no difference	Some concerns

Park et al., 2013	RCT	Knee OA	Midmedial- / midlateral or superolateral portal	US guided injection (nonionic contrast medium, lidocaine, triamcinolone)	Accuracy	Accuracy	Intra-target verified by contrast medium in suprapatellar pouch or meniscus according to X-ray exam (%)	Post-procedure	no difference	Some concerns
					Safety	Adverse events	Complications ¹¹ (%)	n.a. ¹²	no difference	Some concerns
SMALL JOINTS AND PERIARTICULAR STRUCTURES										
Sabeti- Aschraf et al., 2013	RCT (Multicentre)	AC joint arthralgia	Intra- /periarticular approach – AC joint	US Injection (lidocaine, betamethasone)	Safety	Pain Function	Constant-Murley Score	BSL, 1h, 1w, 3w	no difference	Low
					Safety	Pain	pressure pain VAS (cm)	BSL, 1h, 1w, 3w	no difference	Low
					Safety	Pain	pain at night VAS (cm)	BSL, 1h, 1w, 3w	no difference	Low
					Safety	Pain	Crossover arm test	BSL, 1h, 1w, 3w	BSL, 1h, 1,3w: Better for intraarticular approach	Some concerns
					Safety	Adverse events	Complications ¹³ (%)	Up to 3w	no difference	Low
Shinomiya et al., 2016	RCT	Trigger finger	Intra- / extra sheath approach – A1 pulley fingers	Injection (triamcinolone, mepivacaine)	Safety	Pain/Treatment success	Pain remission rate ¹⁴ (%)	BSL, 4w	no difference	Some concerns
					Safety	Adverse events	Complications ¹⁵ (%)	4w	no difference	Some concerns
					Efficacy	Function/Treatment success	Finger Snapping remission rate ¹⁴ (%)	BSL, 4w	no difference	Some concerns
					Efficacy	Fuction/Treatment success	PIP flexion contracture (>10°) ¹⁴ remission rate (%)	BSL, 4w	no difference	Some concerns
					Efficacy	Duration of therapeutic effects	Recurrence of symptoms (months)	4w	no difference	High
					Efficacy	Anatomical differences	The maximal thicknesses of the A1 pulley (mm) ¹⁶	BSL, 4w	no difference	Some concerns
					Efficacy	Anatomical differences	The maximal thicknesses of the flexor digitorum tendons at the level of the A1 pulley (mm) ¹⁶	BSL, 4w	no difference	Some concerns

Mardani-Kivi et al., 2018	RCT	trigger finger	Intra-/extra sheath approach – A1 pulley fingers	US injections (methylprednisolone, lidocaine)	Safety	Pain Function	Quinnell grading system	BSL, 3w, 6w, 12w, 24w, 48w	no difference	Some concerns
					Efficacy	Treatment failure	Need for repeated injection (n°)	BSL, 3w, 6w, 12w, 24w, 48w	no difference	Some concerns
NERVES										
Babaei-Ghazani et al., 2018	RCT	CTS	Above/below median nerve - carpal tunnel	US guided injection (triamcinolone)	Safety	Adverse events	Complications ¹⁷ (%)	Post-procedure, 6w, 12w	no difference	Some concerns
					Safety	Pain	Patient Pain VAS (cm)	BSL, 6w, 12w	no difference	Some concerns
					Safety	Symptom severity	BCTQ - SSS	BSL, 6w, 12w	no difference	Some concerns
					Efficacy	Function	BCTQ - FSS	BSL, 6w, 12w	no difference	Some concerns
					Efficacy	Electrophysiological parameter	distal sensory latency (msec)	BSL, 6w, 12w	no difference	Some concerns
					Efficacy	Electrophysiological parameter	distal motor latency (msec)	BSL, 6w, 12w	no difference	Some concerns
					Efficacy	Electrophysiological parameter	Sensory nerve action potential amplitude (mV)	BSL, 6w, 12w	no difference	Some concerns
					Efficacy	Electrophysiological parameter	Compound motor action potential amplitude (mV)	BSL, 6w, 12w	no difference	Some concerns
					Efficacy	Electrophysiological parameter	Cross-sectional area (mm ²)	BSL, 6w, 12w	no difference	Some concerns
Hsu et al., 2018	Retrospective cohort study	CTS	Intra-/Extraepineurium – carpal tunnel	US guided hydrodissection, injection (lidocaine, triamcinolone)	Safety	Adverse events	Complications ¹⁸ (n°)	Post-procedure	no difference	Serious
					Safety	Symptom severity	BCTQ - SSS	BSL, 2w ¹⁹	no difference	Serious
					Safety	Symptom severity	Decrease of SSS scores	BSL, 2w ¹⁹	2w: better for intraepineurium approach	Serious
					Efficacy	Anatomical differences	Cross section area (mm ²)	BSL, 2w ¹⁹	2w: better for intraepineurium approach	Serious

					Efficacy	Anatomical differences	Cross-sectional area reduction (mm ²)	BSL, 2w ¹⁹	2w: better for intraepineurium approach	Serious
					Efficacy	Patient satisfaction	Patient satisfaction – semi quantitative scale	after treatment ²⁰	no difference	Serious
					Efficacy	Patient satisfaction	Patient satisfaction score ≥3 (n°)	after treatment ²⁰	no difference	Serious
					Efficacy	Patient satisfaction	Patient satisfaction score ≥5 (n°)	after treatment ²⁰	After treatment: better for intraepineurium approach	Serious
					Efficacy	Function	BCTQ – FSS	2w ¹⁹	no difference	Serious
					Efficacy	Function	Decrease of FSS scores	BSL, 2w ¹⁹	2w: better for intraepineurium approach	Serious
Rayegani et al., 2019	RCT	CTS	US ulnar in plane or US midline in plane - Carpal Tunnel	injection (triamcinolone, lidocaine)	Safety	Pain	Improvement in Patient Pain VAS from BSL (cm)	BSL, 10w	no difference	some concern
					Safety	Pain	Pain free grip strength per kg using a dynamometer	BSL, 10w	no difference	some concern
					Safety	Symptom Severity	Improvement in BCTQ - SSS	BSL, 10w	no difference	some concern
					Efficacy	Function	Improvement in BCTQ - FSS	BSL, 10w	no difference	some concern
					Efficacy	Anatomical differences	cross sectional area median nerve (mm ²)	BSL, 10w	no difference	some concern
					Efficacy	Electrophysiological parameter	improvement in sensory nerve action potential latency (ms)	BSL, 10w	no difference	some concern
					Efficacy	Electrophysiological parameter	improvement in sensory nerve action potential amplitude (uV)	BSL, 10w	no difference	some concern
					Efficacy	Electrophysiological parameter	improvement in compound motor action potential latency (ms)	BSL, 10w	no difference	some concern
					Efficacy	Electrophysiological parameter	improvement in compound motor action potential amplitude (mV)	BSL, 10w	no difference	some concern
					Efficacy	Electrophysiological parameter	improvement in nerve conduction velocity (m/s)	BSL, 10w	no difference	some concern

Babaei-Ghazani et al., 2020	RCT	CTS	US radial or US ulnar approach - Carpal Tunnel	injection (triamcinolone)	Safety	Pain	Patient Pain VAS (cm)	BSL, 2w, 6w, 12w	12w: better for radial approach	some concern
					Efficacy	Symptom Severity	BCTQ - SSS	BSL, 2w, 6w, 12w	no difference	some concern
					Efficacy	Function	BCTQ - FSS	BSL, 2w, 6w, 12w	6,12w: better for radial approach	some concern
					Efficacy	Electrophysiological parameter	sensory nerve action potential latency (ms)	BSL, 2w, 6w, 12w	12w: better for ulnar approach	some concern
					Efficacy	Electrophysiological parameter	sensory nerve action potential amplitude (μ V)	BSL, 2w, 6w, 12w	12w: better for radial approach	some concern
					Efficacy	Electrophysiological parameter	compound motor action potential latency (ms)	BSL, 2w, 6w, 12w	no difference	some concern
					Efficacy	Electrophysiological parameter	compound motor action potential amplitude (mV)	BSL, 2w, 6w, 12w	no difference	some concern
					Efficacy	Anatomical differences	median nerve circumference (cm)	BSL, 2w, 6w, 12w	2,6w: better for radial approach	some concern
					Efficacy	Anatomical differences	cross sectional area median nerve (mm ²)	BSL, 2w, 6w, 12w	2,6,12w: better for radial approach	some concern

The abbreviation BSL (baseline) refers to the time point before the intervention happened

AC, acromioclavicular; BCTQ, boston carpal tunnel syndrome; CTS, carpal tunnel syndrome; FSS, function severity score; GH, glenohumeral joint; IA, intraarticular; IA+SA, intraarticular and subacromial; m, month(s) OA, osteoarthritis; RCT, randomized controlled trial; ROM, range of motion; SA, subacromial; SASD, subacromial – subdeltoid bursa; SIJ, sacroiliac joint; SSS, Symptom severity score; US, ultrasound; VAS, visual analogue scale; w, week(s) y, year(s)

¹ The outcomes "Complications" are usually only presented in descriptive manner by the respective authors. Statistical tests were not performed by the authors, unless stated otherwise.

² No difference = at none of the give time points a difference was found between the groups. If differences were found, the time point for the differences is depicted.

³ For details on RoB see supplementary table 3

⁴ ROM of internal rotation was better in the SASD group after the procedure; however, ROM was already significantly better in the SASD group before the intervention.

⁵ Intramuscular injections into the subscapularis and the scapulothoracic bursa were performed three times with a 1-week interval between injections.

⁶ No serious complications such as pneumothorax or infection, or symptoms attributable to the side effects of steroid were encountered.

⁷ Index test = microbiology culture at respective site (any germ makes a pos. results), reference standard = pathohistological diagnosis at the respective site, divided by total number of biopsy specimen (if multiple) and multiplied by 100 to yield a percentage (0-100%)

⁸ index test is microbiology culture at respective site, reference standard is pathohistological diagnosis at the respective site - Each biopsy pair (culture, histo) should always be taken from the same spot (0-100%)

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- ⁹ The needle touched the patella cartilage or periosteum (no other complications happened)
- ¹⁰ No major complications, such as infection or fat atrophy
- ¹¹ None of the patients had joint infection or systemic side effects after injection.
- ¹² Not described by the authors
- ¹³ Possible complications included hematoma, increased pain, reddening in the puncture area
- ¹⁴ In case patients had pain/finger snapping/PIP contracture at BSL, they were assessed for remission of pain after 4 weeks
- ¹⁵ Such as tendon rupture or skin atrophy – none of them happened
- ¹⁶ In the longitudinal plane
- ¹⁷ No complications such as vessel insult or median nerve injury
- ¹⁸ Complications such as Median nerve injury, permanent median nerve damage, hematoma, scar, abscess
- ¹⁹ After a mean 2 weeks after the intervention
- ²⁰ Exact time point not reported

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