

Supplementary Table 1| Summary of study designs

Study	Design	Intervention(s)	Stated eligibility criteria	Size		Follow-up	Outcomes	
				Recruited*	Analysed		Primary	Secondary
Randomised Comparative Studies								
Avanzi 2019, Italy	RCT	Conexa® vs no augmentation	(1) Aged 50-80 years (2) Small-medium RC tears (3) Patte retraction type 1 and 2 (4) Fuchs muscular index; negative and neutral (5) Stage ≤2 fatty degeneration of supraspinatus according to Goutallier <i>et al.</i> [†] (6) Osteoarthritis grade 0 or 1 according to Fukuda (7) No traumatic RC tears (8) No concomitant shoulder pathology or surgery (9) No corticosteroid injections within last 6 months (10) No infective, systemic or rheumatological conditions	92	68	MRI 1,6,12 and 24 months Clinical evaluation 3,6,12 and 24 months	Repair failure	EuroQol-VAS, Constant, DASH, SST
Barber 2012, USA	RCT	Graftjacket® augmented repair vs no augmentation	(1) Aged 18-75 years (2) Large (>3cm width + 2-tendon involvement) RC tears (3) Primary RC repair (4) Amenable to arthroscopic repair (5) Good preoperative movement of contralateral arm (6) Ability to perform postoperative exercises (7) Willingness to read and understand English for PROMs (8) Willingness to participate in post-operative follow-up (9) No massive (>5cm) or subscapularis tears (10) No inflammatory, autoimmune disease, cancer, highly communicable disease or active infection (11) Non-smokers only	NR	42	MRA, 12 or 24 months Clinical evaluation, 6 and 12 months, annually thereafter	Repair failure	Constant, UCLA, ASES
Bryant 2016, Canada	RCT	Restore® augmented repair vs no augmentation	(1) All patients scheduled for RC repair (2) Able to repair defect with a residual defect of ≤1cm or <1cm of medialization (3) No other shoulder disease; Grade II-IV SLAP lesion, Bankart lesion, Hill Sachs Lesion, ≥ grade 3 OA [†] (4) No significant shoulder girdle paralysis (5) No systemic or active joint infection (6) No major medical or psychiatric illness, or developmental handicap (7) No previous shoulder surgery (except acromioplasty or diagnostic arthroscopy) (8) Ability to read and understand English (9) Willingness to be assessed for 1 year after surgery	62	62	MRA, 12 months Clinic evaluation, 1.5, 3, 6,12, 18 and 24 months	Repair failure	WORC, ASES, Constant, SST, SF-36
Iannotti 2006, USA	RCT	Restore® augmented repair vs no augmentation	(1) Large or massive tears of supraspinatus and infraspinatus tendons on pre-op MRI (2) Age > 18 years (3) Tear ≥ 3 months' duration (4) Fully repairable tear – determined intraoperatively (5) No prior shoulder surgery (6) No glenohumeral arthritis, frozen shoulder or cervical spine disease	32	30	MRA, 12 months Clinical Scores, Mean 14 months (range 12-26.5)	Repair failure	PENN, SF-36
Lamas 2019, Spain	Comparative observational study	MSCs + OrthADAPT™ vs OrthADAPT™	(1) Unilateral shoulder pain (2) Full-thickness RC tear on MRI (3) Failure of 3-months non-operative management (4) No rheumatic disease, glenohumeral OA, fractures (1) No diabetes mellitus, infections or tumors	13	13	MRI, 12 months Clinical evaluation, 12 months	Constant	Repair Failure, VAS
Leuzinger 2016, Switzerland	RCT	Graftjacket® vs Artelon® vs Restore®	(2) Primary or revision RC repair (3) Stage ≥2 fatty degeneration of supraspinatus according to Goutallier <i>et al.</i> [†] (4) No history of glenohumeral OA (5) Repairable tear not requiring bridging with a patch (6) At least 3 years follow-up	92	89	MRI, 6 months Clinical evaluation 6 and 36 months	Repair failure, Constant, SSV	-

Cai 2018, China	RCT	3D collagen matrix vs no augmentation	(1) Large or massive RC tears in pre-op MRI and US (2) Isolated supraspinatus tear (3) Arthroscopically repairable (4) No long head of biceps injury (5) Failure of 6-months non-operative treatment (6) No previous ipsilateral shoulder surgery (7) Pathological subscapularis (8) No glenohumeral arthritis	112	104	MRI, 24 months Clinical Scores 6, 12 and 24 months	UCLA, Constant, VAS, Repair failure	-	
Non-Randomised Comparative Studies									
Ciampi 2014, Italy	Comparative observational study	Repol Angimesh augmented repair vs Tutopatch augmented repair vs no augmentation	(1) Pre-op MRI evidence of a full-thickness tear involving 2 tendons (2) Postoperative residual retraction of 2 cm (3) Stage 1 or 2 fatty degeneration according to Goutallier <i>et al.</i> ¹ (4) Failure of 6-months non-operative management consisting of physical therapy and anti-inflammatory medications (4) Duration of symptoms for at least 3 months (5) No other shoulder pathology requiring additional procedures; Grade II-IV SLAP lesion, Bankart lesion, biceps tenodesis (6) No glenohumeral OA, inflammatory arthritis or any rheumatic condition (7) No cortisone injections within 12 weeks of surgery (8) No contralateral shoulder injuries	N/A	152	US, 12 months Clinical Scores, 2 and 35 months	UCLA	VAS, Repair failure	
Flurry 2018, Switzerland	Comparative observational study	DX reinforcement matrix + PRP vs no augmentation +/- PRP	(1) Complete tear of supraspinatus (2) Aged ≥ 60 years (3) Failure of nonsteroidal anti-inflammatory medication and physiotherapy (4) No glenohumeral OA (5) No previous rotator cuff repair or reconstruction (6) No fatty degeneration of supraspinatus > stage 2 according to Goutallier <i>et al.</i> ¹ (7) No rheumatoid arthritis, insulin-treated diabetes, infection, neurovascular disorders of affected arm, pathological bone metabolism, pregnant at time of surgery	40	38	US, 6 months MRI, 24 months Clinical examination and Scores, 3, 6 and 24 months	Constant, ASES, OSS, DASH, EQ-5D, Repair Failure, Strength(kg), ROM (degrees)	-	
Gilot 2015, USA	Comparative observational study	Arthroflex® augmented repair vs no augmentation	(1) Patient is scheduled for primary RC repair (2) Large to massive rotator cuff tear on MRI (3) Aged 18-85 years (4) Patient is willing and able to provide scores for the study (5) No known allergy to the augmentation material (6) No drug, solvent or alcohol addiction (7) No bacteremia, systemic or surgical site infection (8) No pregnant or nursing patients (9) No history of autoimmune disease (10) No personal beliefs prohibiting use of grafts	40	35	US and Clinical Score, 1,5,3,6,12 and 24 months	Repair failure	SF-12, ASES, VAS, WORC, shoulder activity level survey	
Ito 2003, Japan	Comparative observational study	Fascia lata allograft vs no augmentation	(1) Large or massive cuff tears on MRI or pneumo-arthrogram (2) Pain and loss of function despite conservative therapy	28	21	Final follow-up (range 2-8 years)	Japanese Orthopaedic Association shoulder surgery score, ROM (degrees)	-	
Jeon 2017, South Korea	Comparative observational study	Long head of biceps vs no augmentation	(1) L-shaped rotator cuff tears (2) Minimum follow-up period of 2 years (3) No revision surgery (4) No subscapularis tendon tears (5) No glenohumeral OA or instability	N/A	64	MRI, 6 months US, 12 months Clinical evaluation, 3,6,12 and final follow-up (range 24-40 months)	ASES, Constant, VAS, Strength (NR)	-	
Maillot 2018, France	Comparative observational study	Conexa™ vs standard repair vs debridement only	(5) Large to massive RC tear on MRI or CTA (6) Failure of non-operative management consisting of a period of relative rest, nonsteroidal anti-inflammatory medication, physiotherapy > 3 months and >2 corticosteroid (7) Functional impairment or unacceptable pain for a minimum of 3 months (8) Stage 2 or 3 fatty degeneration according to Goutallier <i>et al.</i> ¹ (9) No glenohumeral OA or prior ipsilateral shoulder surgery	32	32	Clinical evaluation, 3,6,12 and 24 months	Constant	VAS, ROM (degrees)	
Mori 2013, Japan	Comparative observational study	Tensor Fascia Lata vs no augmentation	(1) Irreparable large or massive RC tear with pain and functional disability refractory to conservative treatment (2) Stage 3-4 fatty degeneration of supraspinatus + stage 1-2 degeneration of infraspinatus according to Goutallier <i>et al.</i> ¹ (3) Intact teres minor tendon (4) Availability of MRI to evaluate the integrity of the rotator cuff tendons and/or autografts pre- and post-operatively	N/A	48	MRI, not reported Clinical evaluation, 6, 12 and 24 months	Repair failure	Constant, ASES, UCLA, VAS	

			(5) Minimum follow-up period of 24 months (6) Absence of the drop-arm sign (7) Absence of stage 3 or 4 fatty degeneration of infraspinatus (8) Stage 1 or fatty degeneration of supraspinatus were excluded (9) Absence of full thickness subscapularis tendons (10) No history of; surgery, nerve palsy, glenohumeral OA, diabetes, symptom onset following motor vehicle accident						
Mori 2015, Japan	Comparative observational study	Tensor Fascia Lata + grade 1-2 [†] infraspinatus fatty atrophy vs Tensor Fascia Lata + grade 3-4 [‡] infraspinatus fatty atrophy	(1) Irreparable large to massive RC tear (2) Pain + disability refractory to nonsurgical treatment (oral anti-inflammatory medications, corticosteroid injections + physical therapy) (3) Stage 3 -4 fatty degeneration of supraspinatus according to Goutallier <i>et al.</i> [‡] (4) Intact teres minor tendon (5) <75% fatty degeneration of infraspinatus (6) Availability of MRI to evaluate the integrity of the rotator cuff tendons and/or autografts pre- and post-operatively (7) Minimum follow-up period of 24 months (8) Absence of the drop-arm sign (9) No history of; surgery, nerve palsy, glenohumeral OA, diabetes, symptom onset following motor vehicle accident (10) No full subscapularis tears	N/A	45	MRI, not reported Clinical evaluation, 6, 12 and 24 months	Repair failure	Constant, ASES, ROM	
Tempelaere 2017, France	Comparative observational study	Quadriceps tendon vs no augmentation	(1) Massive RC tears (2) Patients < 70 years old (3) Pain + loss of strength refractory to medical treatment (≥1 injection, rehabilitation session) (4) No stage 3 -4 fatty degeneration of supraspinatus or infraspinatus according to Goutallier <i>et al.</i> [‡] (5) No history of ipsilateral; shoulder surgery, dislocation, fracture, glenohumeral OA, diabetes, symptom onset following motor vehicle accident	80	50	Final follow up – range 12-116 months	Constant, Subjective shoulder value (SSV), Strength(kg)	-	
Venn 2020, Netherlands	Comparative observational study	Long head of biceps vs non-operative	(1) Massive RC tear (2) Patients ≥ 50 years old (3) Unresponsive to ≥ 3 months of non-operative treatment (4) No symptomatic glenohumeral or acromioclavicular OA (5) No rheumatoid arthritis (6) No previous surgery on ipsilateral arm (7) No cognitive or linguistic issues	NR	9	MRI, 12 months Clinical Scores, 3, 6 and 12 months	Constant, SST, WORC, VAS, Repair failure	-	
Vitali 2015, Italy	Comparative observational study	Repol Angimesh + Long head of Biceps augmented repair vs no augmentation	(1) MRI evidence of a full-thickness tear involving 2 tendons, (2) Stage 1 or 2 fatty degeneration according to Goutallier <i>et al.</i> [‡] (3) Patients with pain and a deficit in elevation, not responding to physiotherapy (4) Intraoperative evidence of irreparable rotator cuff lesion (5) Minimum follow-up of 3 years after surgery (6) Active and motivated patients (7) No other shoulder pathology requiring additional procedures; Grade II-IV SLAP lesion, Bankart lesion, biceps tenodesis (8) No glenohumeral OA, inflammatory arthritis or any rheumatic condition (9) No cortisone injections within 12 weeks of surgery (10) No contralateral shoulder injuries	N/A	120	MRI, 12 months Clinical evaluation, 3 and 36 months	UCLA	Repair failure, VAS, range of motion (degrees), Strength(kg)	
Walton 2007, Australia	Comparative observational study	Restore [®] augmented Repair vs no augmentation	(1) Poor-quality tendon or a large-to-massive full-thickness tear of a tendon that could be attached to the greater tuberosity after appropriate mobilization techniques (2) Intact subscapularis tendon	NR	31	MRI, 24 months 3 months, 6 months, and 24 months	Repair failure, Pain and function questionnaire [#] , systematic shoulder examination [‡] , strength(N)	-	
Yoon 2016, South Korea	Comparative observational study	Bone Marrow Stimulation + Allocover [™] augmented repair vs no augmentation	(1) Massive RC tears (2) Persistent severe pain and disability (3) Unresponsive to ≥ 6 months of non-operative treatment (4) Repairable RC tears (5) Minimum follow-up of 1 year after surgery (6) No advanced glenohumeral OA (≥ stage 4, Hamada <i>et al.</i>) [§] (7) No prior surgery to affect shoulder (8) No contralateral shoulder lesions	87	75	MRI, 12 months Clinical evaluation, 12 months + final follow-up (range 14-43)	VAS, UCLA, Constant, ASES, SST, Repair failure	-	
Non-comparative studies									
Agrawal 2012, USA	Non-comparative observational study	Allopatch HD [™]	(1) Primary RC tears ≥ 3 cm (2) Recurrent RC tears of any size (3) Arthroscopic repair undertaken	N/A	14	MRI, 1-2 years Clinical evaluation, 12 months	Repair failure, Constant, Flex SF	-	

Audenaert 2006, Belgium	Non-comparative observational study	Mersilene®	(1) Primary massive full-thickness tears of ≥ 2 tendons, measuring >4 cm in maximal diameter (2) Irreparable by simple suture (3) Open repair undertaken (4) Inability to elevate arm beyond 90° after 3 months, despite maximal conservative treatment	41	41	US and Clinical evaluation, Mean 43 months (range 24–86)	Repair failure, Constant	-
Badhe 2008, UK	Non-comparative observational study	Zimmer® collagen repair patch	(1) MRI or US evidence of RC tears ≥ 5 cm involving both the supraspinatus and infraspinatus tendons (2) Refractory to a trial of nonoperative management, including physiotherapy and steroid injections	10	10	MRI + USS, 'final follow-up' - Mean 54 months (range 36-60) Clinical evaluation, 12 months + 'final follow-up'	Constant, Repair failure	-
Bektasler 2010, Turkey	Non-comparative observational study	Coroacromial ligament	[Eligibility criteria not explicitly stated] (1) Treated for a rotator cuff tear between 2003-2009	N/A	46	Clinical evaluation, 1, 3 + 12 months (range NR)	Constant, Acromio-humeral distance	-
Bond 2008, USA	Non-comparative observational study	Graftjacket®	(2) MRI evidence RC tears ≥ 5 cm and/or 2 tendon tears (3) Irreparable tears – determined at prior arthroscopy	N/A	16	MRI, 3 + 12 months Clinical evaluation, 3, 6, 12 months and 'final follow-up' - Mean 26.7 months (range 12-38)	UCLA, Constant, SST, Pain Score, Repair failure	-
Burkhead 2007, USA	Non-comparative observational study	Graftjacket®	(1) Massive (≥ 2 tendon + ≥ 5 cm) or recurrent RC tears (2) Repairable tears only (3) No active infection	N/A	17	MRI/CTA and Clinical evaluation, Mean 14.4 months (range NR)	UCLA, Pain, Repair failure	-
Cho 2014, South Korea	Non-comparative observational study	Permacol™	(1) Posterosuperior massive RC tear (≥ 5 cm or ≥ 2 tendon), confirmed by MRI and arthroscopy (2) Inability to reduce the residual cuff to the anatomic (3) Active individuals ≤ 60 years (4) Unresponsive to > 3 months of non-operative treatment (5) No prior shoulder surgery (6) Able to comply with the post-op rehabilitation programme (7) Anterosuperior massive RC tears were excluded (8) No irreparable RC tears - could be only partially repaired despite full mobilisation (9) No superior humeral head migration (10) No stage 3-4 fatty degeneration according to Goutallier <i>et al.</i> ³	5	5	MRI, 6 months Clinical evaluation, 'final follow-up' - Mean 20.6 months (range 14-27)	VAS, UCLA, ASES, Repair failure	-
Consigliere 2017, UK	Non-comparative observational study	DX reinforcement matrix	(1) Large (>3 cm) + Massive (>2 tendon) RC tears (2) Repairable RC tears only (3) Poor tissue quality only (4) Patients will achievable objectives (pain relief + improved function) (5) No evidence of cuff arthropathy (6) No signs of glenohumeral OA (7) No stage 4 fatty degeneration according to Goutallier <i>et al.</i> ⁴ (8) No active infections	10	10	Clinical evaluation, 3,6 and 12 months	Constant, OSS, VAS	-
Encalada-Diaz 2011, Mexico	Non-comparative observational study	Polycarbonate polyurethane patch	(1) Full-thickness tear of supraspinatus or infraspinatus tendon and intact subscapularis	10	10	MRI + US, 6 and 12 months Clinical evaluation, 0.5,1,3,6 +and 12 months	SST, VAS, ASES, UCLA, SF-12, Repair failure	-
Flury 2012, German	Non-comparative observational study	Graftjacket® Arthroflex	(1) Symptomatic revision RC tear with poor quality tendon (degeneration or delamination) (2) Aged > 60 years with unfavourable co-morbidities (massive rupture, diabetes, steroid therapy) (3) No Irreparable RC tear	N/A	8	USS or MRI – 6 months Clinical evaluation, 6 or 9 months	Constant, OSS, SSV	-

Giannotti 2014, Italy	Non-comparative observational study	Zimmer® Collagen Repair Patch	[Eligibility criteria not explicitly stated] (1) Massive RC tear with minimum follow-up of 30 months	N/A	9	US, MRI and clinical evaluation, Mean 36 months (Range 30-45)	Repair failure, ASES, Constant, Strength (BMRC), Electromyography	-
Gouk 2019, Australia	Non-comparative observational study	Graftjacket®	(1) Minimum 6 months of follow-up (2) Massive (>5cm) + Massive (>2 tendon) RC tears (3) Primary or re-do repairs included (4) Symptomatic and failed conservative treatment (5) No glenohumeral OA (6) Functional deltoid	N/A	7	MRI, 6 months Clinical evaluation, Mean 12 months (range NR)	Repair failure	Constant, OSS, DASH, Strength(N)
Gupta 2012, USA	Non-comparative observational study	Graftjacket®	(1) Full thickness RC tear with >5cm retraction on pre-op MRI (2) Unresponsive to > 6 months of non-operative treatment, including physiotherapy + nonsteroidal anti-inflammatories (3) Inability to reduce the residual cuff to the anatomic (4) Ability to fully participate in the postoperative rehabilitation (5) No glenohumeral OA and/or cuff tear arthropathy (6) No stage 3-4 fatty degeneration according to Goutallier <i>et al.</i> † (7) No prior rotator cuff repair	24	24	US, Mean 36 months (range NR) Clinical evaluation, Mean 36 months (range 29-42)	VAS, ASES, SF-12, ROM (degrees), Strength (BMRC), Repair failure	-
Gupta 2013, USA	Non-comparative observational study	Conexa™	(1) Full thickness RC tear with >5cm retraction and/or >2 tendon full-thickness RC tear visualised during arthroscopy (2) Unresponsive to > 6 months of non-operative treatment, including physiotherapy + nonsteroidal anti-inflammatories (3) Inability to reduce the residual cuff to the anatomic (4) Ability to fully participate in the postoperative rehabilitation (5) No glenohumeral OA and/or cuff tear arthropathy (6) No stage 3-4 fatty degeneration according to Goutallier <i>et al.</i> †	26 patients, 27 shoulders	26 patients, 27 shoulders	US + Clinical evaluation, Mean 32 months (range 24-40)	VAS, ASES, SF-12, ROM (degrees), Strength (BMRC), Repair failure	-
Hirooka 2002, Japan	Non-comparative observational study	Gore-tex® Expanded PTFE patch	NR	27 patients, 28 shoulders	27 patients, 28 shoulders	Clinical evaluation, Mean 44 months (range 24-72)	Japanese Orthopaedic Association shoulder surgery score, strength (kg)	-
Johnson 2019, UK	Non-comparative observational study	Graftjacket®	(1) Large(3-5cm) or Massive RC tears (≥2 tendons) (2) Unable to achieve primary complete repair without tension but able to achieve partial cuff repair (3) No glenohumeral OA	N/A	13 patients, 14 shoulders	US + Clinical evaluation, Mean 41 months (range 23-59)	Constant, OSS, Quick DASH, ROM (degrees), repair failure	-
Lederman 2016, USA	Non-comparative observational study	Conexa™	(1) Aged 40-70 years (2) Repairable primary large (3-5cm) RC tears (3) ≥90° movement of the non-operative arm (4) Able to perform postoperative exercises (5) Able to return for all scheduled and required study visits (6) No Irreparable tears – inability to approximate the tendon to the tuberosity without tension (7) No subscapularis tears (8) No stage 3-4 fatty degeneration † (9) No prior RC repair on the affected shoulder (10) No patients with: inflammatory disease, autoimmune disease, cancer, insulin-dependent diabetes, chronic steroid use, malnourishment, active infection, history of alcohol or drug abuse, significant mental illness, tobacco user within last 6 months, ASA class 4 or 5 (11) Can walk without aids (12) No known allergy to the augmentation material	68	61	MRI, 6 + 12 months Clinical evaluation, 6,12 + 24 months	ASES, Constant, SST, Repair failure	-
Lenart 2015, USA	Non-comparative observational study	X-repair	(1) Massive RC tears (≥2 tendons) repaired with X-repair patch (2) Primary or revision RC surgery (3) No history of instability, moderate-severe glenohumeral OA, shoulder surgery within the follow-up period	N/A	13	Clinical evaluation, Mean 18 months (range 14.4-20.4)	ASES, PENN, SANE, Repair failure	-
Malcarney 2005, Australia	Non-comparative observational study	Restore®	(1) A poor-quality of deficient tendon (2) 5 patients also met the criteria for a concurrent comparative trial (Walton <i>et al.</i> 2007)	N/A	25	NR	Early complications	-
Marberry 2012, USA	Non-comparative observational study	Artelon®	(1) Large or massive RC tear diagnosed on MRI (2) Pain and insufficient muscle function for ≥3 months	17	16	MRI, NR	Constant, WORC, SF36, Repair failure	-

			(3) Reparable tendon of poor quality, determined at the time of surgery (4) No evidence of active infection, significant osteoarthritis in the shoulder, chronic dislocation or glenohumeral OA (5) No systemic corticosteroids, chemotherapeutics or major medical conditions				Clinical evaluation, 3,6 +12 months	
Metcalf 2002, USA	Non-comparative observational study	Restore®	[Eligibility criteria not explicitly stated] (1) Massive RC tears (>5cm ²) with retraction medial to glenoid (2) Significant atrophy of supraspinatus and infraspinatus on pre-operative MRI.	N/A	12		Clinical evaluation, 2 years	UCLA, SST, SF-36, ROM (degrees), Strength (BMRC)
Modi 2013, UK	Non-comparative observational study	Graftjacket®	(1) Irreparable large or massive RC tears (≥3 cm) (2) No history of inflammatory or autoimmune disease (3) Patients undergoing RC repair after arthroplasty were excluded	61	61		Clinical evaluation 3, 6, 12 months + yearly thereafter	OSS, VAS, ROM (degrees), Strength (BMRC)
Moore 2006, USA	Non-comparative observational study	Cadaveric allograft	(1) Irreparable, massive RC tears (≥ 2 tendons)	N/A	32		MRI, Mean 33.7 months (range 3-124) Clinical evaluation, Mean 31.3 months (range 1 – 123)	Repair failure, UCLA
Nada 2010, UK	Non-comparative observational study	Dacron	(1) Full-thickness massive RC tear (>5cm + ≥ 2 tendons) on MRI (2) Pain + disability despite conservative treatment (3) A functional deltoid muscle (4) Primary or revision (3 cases) RC repairs (5) Compliance with post-operative rehabilitation (6) No history of; cuff tear arthropathy with stiffness, infection, any neurological condition effecting the shoulder girdle	21	21		MRI + Clinical evaluation, Mean 36 months (range 30-46)	Constant, VAS, ROM(degrees), Strength (BMRC), Satisfaction
Neumann 2017, USA	Non-comparative observational study	Conexa™	(1) Irreparable massive RC tear (>5cm) on MRI (2) Primary or revisions (8 cases) RC repairs (3) Failure of 6 months non-operative management (non-steroidal anti-inflammatories and/or physical therapy) (4) Able to participate in post-operative physical therapy (5) No glenohumeral OA, cuff arthropathy, >50% fatty infiltration of supraspinatus on MRI,	85 shoulders 84 patients	61 shoulders 60 patients		US + Clinical evaluation, Mean 50.3 months (range 24-63)	Modified ASES, VAS, ROM(degrees), Strength (BMRC)
Petrie 2013, UK	Non-comparative observational study	LARS™	(1) Symptomatic massive RCT clinically and radiologically (2) Stage 3-4 fatty degeneration according to Goutallier <i>et al.</i> † (3) Not amenable to primary arthroscopic repair (4) No patients over 75 years with arthritis	53 shoulders 50 patients	31 shoulders 28 patients		Clinical evaluation 4 + 24 months	OSS
Petri 2016, USA	Non-comparative observational study	Arthroflex®	(1) Open revision of large to massive posterolateral RC tears with biological augmentation (2) Patients with concomitant SLAP tears, OA, biceps pathology or subscapularis tears were included (3) No stage 3-4 fatty degeneration according to Goutallier <i>et al.</i> † (4) Patient who underwent primary augmented repair, arthroscopic augmented repair or revision of a prior augmented repair were excluded	N/A	13		MRI, Mean 9.9 months (range 0.3-26.3) Clinical evaluation, Mean 30 months (range 24 -48)	ASES, QuickDASH, SANE, SF-12, Repair failure
Petricciolo 2013, Italy	Non-comparative observational study	SportMesh™	[Eligibility criteria not explicitly stated] (1) Open repair of subscapularis tendon	N/A	10		US + Clinical evaluation, Mean 23 months (range 12-34)	Constant, DASH, VAS, Repair failure
Phipatanakul 2009, USA	Non-comparative observational study	Restore®	(1) Rotator cuff tears that could not be advanced to the native footprint or to reinforce thin attritional tissues	11	11		MRA, Mean 25 months (range 14-38) Clinical evaluation, Mean 26 months (range 14-38)	UCLA, ASES, Repair failure
Proctor 2014, USA	Non-comparative observational study	X-repair	(1) Massive RC tears (≥ 2 tendon tears), (2) Failure of non-operative treatment (3) No evidence of adhesive capsulitis	18	18		US or MRI, NR Clinical evaluation, 3,6,12 months + 'final follow-up' - Mean 42 months (range 35-47)	ASES, Repair failure
Rhee 2008, South Korea	Non-comparative observational study	Long head of biceps	(1) Massive (>5cm) RC tears at arthroscopy (2) No history of SLAP lesion, acromioclavicular arthritis requiring distal clavicle resection, glenohumeral OA, neural damage, prior shoulder surgery	N/A	31		MRI, NR Clinical evaluation, 1,5,3,6,12 months + 'final follow-up' - Mean 32 months (range 24-67)	Constant, UCLA, SST, VAS, ROM (Degress), Strength (kg)
Rotini 2011, Italy	Non-comparative observational study	Acellular Human Dermal Matrix	(3) Aged <55 (4) Healthy with high functional demands	N/A	5		MRI, NR	Repair failure, Constant

			(3) Large to massive tears [§] (4) Tendon retraction < 3 according to Thomazeau <i>et al.</i> ¹ (5) No stage 3-4 fatty degeneration according to Goutallier <i>et al.</i> [‡] (6) ≥1 year follow-up (7) No OA degeneration (even mild), frozen shoulder, symptomatic acromioclavicular arthritis, autoimmune connective tissue disease, allergy to penicillin or pork (8) Able to engage with rehabilitation regimen			Clinical evaluation, Mean; NR (range 12-18 months)		
Sano 2010, Japan	Non-comparative observational study	Long head of biceps	[Eligibility criteria not explicitly stated] (1) Irreparable massive RC tears (≥ 2 tendons) with concomitant long head of biceps pathology (2) > 12 months follow-up available	N/A	14	MRI + clinical evaluation, Mean; 28 months (range 48-79)	Repair Failure, Japanese Orthopaedic Association shoulder surgery score	-
Schlegel 2017, USA	Non-comparative observational study	Collagen Sheet	(1) Chronic, degenerative partial (≥ 25%) thickness tear of supraspinatus tendon (2) ≥ 21 years old (3) Unresponsive to conservative therapy (analgesia, physiotherapy or injections) for > 3 months (4) No; full-thickness tears, acute injuries, previous surgery on same shoulder, shoulder instability, chondromalacia (> grade 3), > grade 2 cuff muscle fatty infiltration, severe calcification, IDDM, Workers' Compensation, smokers, hypersensitivity to bovine collagen, genetic collagen disease, autoimmune, immunodeficiency, chronic inflammatory disorders patients (5) No oral steroid use for 2months (or IM steroid use for 1 month)	33	33	MRI+ clinical evaluation, 3 months and 1 year [§]	Repair failure, Constant, ASES	-
Scheibel 2007, Germany	Non-comparative observational study	Humeral Periosteum	(1) Degenerative symptomatic full-thickness supraspinatus tears (2) High functional demand (3) Tendon retraction < 3 according to Thomazeau <i>et al.</i> ¹ (4) No stage 3-4 fatty degeneration according to Goutallier <i>et al.</i> [‡] (5) No; partial RC tears, traumatic history, prior surgery to affected shoulder, cuff tear arthropathy (acromiohumeral distance <6mm)	20	20	MRI, 12 months Clinical evaluation, Mean 14.4 months (range 12-21)	Repair failure, Constant, SST	-
Scamberg 2004, USA	Non-comparative observational study	Restore [®]	(1) Symptomatic, atrophic, retracted large and massive (≥2-tendon) RC tears on MRI and confirmed at surgery	N/A	11	MRI + clinical evaluation, Mean; NR (range 6-10 months)	ASES, Repair Failure	-
Sears 2014, USA	Non-comparative observational study	GraftJacket [®] or TissueMend or Conexa [™]	[Eligibility criteria not explicitly stated] (1) Full thickness rotator cuff repairs (2) Revision surgery	31	24	MRI or US, Mean 4.2 years (range, NR) Clinical evaluation, Mean 4.2 years (range 30-112)	Repair failure, ASES and SANE	-
Smolen 2020, Switzerland	Non-comparative observational study	Pitch-Patch	(1) Massive RC tears (2) Age 40 to 75 years old (3) No stage 4 fatty degeneration according to Goutallier <i>et al.</i> [‡] No revision operations	58	50	MRI + clinical evaluation, Mean 52 months (range 25-74)	Constant, subjective shoulder value, MRI	-
Venouziou 2013, USA	Non-comparative observational study	Graftjacket [®]	(1) Massive (>5cm) RC tear (2) Not capable of mobilisation (3) ≥18 months follow-up was available	N/A	14	Clinical evaluation, 1.5, 3,6,12 months + 'final follow-up'- Mean 30.2 months (range 18-52)	VAS, ASES, ROM (degrees), Strength (BMRC)	-
Wong 2010, USA	Non-comparative observational study	Graftjacket [®]	[Eligibility criteria not explicitly stated] (1) Large and massive RC tears (2) Motivated, intelligent, younger patients with disabling pain but intact biceps tendons (3) Functioning subscapularis muscle (4) No glenohumeral OA, immunocompromise or heavy smokers	N/A	45	Clinical evaluation, Mean;NR, (range 24-68)	UCLA, WORC, ASES	-

Supplementary Table 2 | Risk of bias (Randomised Trials)

Study	Randomisation	Assignment to interventions	Incomplete outcome data	Outcome Measurement	Selective reporting	Overall Assessment
Avanzi 2019	High	Low	Some	Low	Some	High
Barber 2012	High	Some	High	Some	Some	High
Byrant 2016	Low	Low	Some	Low	Some	Some
Ianotti 2006	Some	High	Some	High	Some	High
Lamas 2019	High	Some	Low	Low	Low	High
Leuzinger 2016	Some	High	Low	High	Some	High
Cai, 2018	High	High	Some	Some	Some	High

Supplementary Table 3 | ROBINS-I Risk of bias (Non-randomised Comparative Trials)

Study	Type of Bias							Overall Assessment
	Bias due to confounding	Bias in participant selection	Bias in classification of interventions	Bias due to deviation from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported results	
Ciampi 2014	Serious	Moderate	Low	Low	No information	Serious	No information	Serious
Flury 2018	Serious	Serious	Moderate	Low	Moderate	Serious	Moderate	Serious
Gilot 2015	Serious	Serious	Low	Low	Serious	Serious	Serious	Serious
Ito 2003	Serious	Serious	Moderate	No information	No information	Serious	Moderate	Serious
Jeon 2017	Moderate	Serious	Moderate	No information	No information	Serious	Moderate	Serious
Maillot 2018	Moderate	Serious	Low	No information	Low	Serious	Serious	Serious
Mori 2013	Serious	Serious	Low	Low	Serious	Serious	Serious	Serious
Mori 2015	Serious	Serious	Moderate	Low	Moderate	Serious	Serious	Serious
Tempelaere 2017	Serious	Serious	Moderate	No information	Serious	Serious	Moderate	Serious
Veen 2020	Serious	Serious	Serious	Low	No information	Serious	Moderate	Serious
Vitali 2015	Serious	Serious	Low	No information	Serious	Serious	Serious	Serious
Walton 2007	Moderate	Serious	Low	No information	Serious	Serious	Low	Serious
Yoon 2016	Serious	Serious	Low	No information	Serious	Serious	Serious	Serious

Supplementary Table 4 | Shoulder Specific Functional outcome scores

Study	Shoulder Specific Functional Scores																						
	ASES, Mean (±SD or range)			Constant, Mean (±SD or range)			OSS, Mean (±SD or range)			PENN, Mean (±SD or range)			SST, Mean (±SD or range)			UCLA, Mean (±SD or range)			WORC, Mean (±SD or range)				
	Baseline	Intermediate	Final†	Baseline	Intermediate	Final†	Baseline	Intermediate	Final†	Baseline	Intermediate	Final†	Baseline	Intermediate	Final†	Baseline	Intermediate	Final†	Baseline	Intermediate	Final†		
Randomised Comparative Studies																							
Avanzi 2019	Conexa®			46.2 (±14.4)	3 mnths: 71.0 (±12.0) 6 mnths: 91.5 (±8.7) 12 mnths: 92.6 (±8.5)	2 yrs: 95.5 (±5.5)							2.6 (±2.9)	3 mnths: 7.3 (±2.8) 6 mnths: 10.0 (±2.2) 12 mnths: 9.7 (±2.6)	2 yrs: 10.4 (±2.2)								
	Control			49.8 (±11.8)	3 mnths: 65.0 (±11.6) 6 mnths: 87.4 (±9.7) 12 mnths: 89.2 (±9.6)	2 yrs: 92.6 (±9.3)							2.9 (±2.5)	3 mnths: 6.9 (±2.7) 6 mnths: 9.7 (±2.5) 12 mnths: 10.3 (±1.9)	2 yrs: 10.4 (±2.0)								
						3 mnths: p=0.01 6 mnths: p=0.02 12 mnths: p=0.02	p=NS						p=NS			p=NS							
Barber 2012	Graftjacket®	48.5 (±NR)		2 yrs: 98.9 (±4.2)	41.0 (±NR)	2 yrs: 91.9 (±9.2)										13.3 (±NR)	2 yrs: 28.2 (±2.1)						
	Control	46.0 (±NR)		2 yrs: 94.8 (±14.2)	45.8 (±NR)	2 yrs: 85.3 (±11)										15.9 (±NR)	2 yrs: 28.3 (±3.0)						
				p= 0.035	p= 0.008												p= 0.43						
Bryant 2016	Restore®	52.2 (±3.3)	1 yr: 83.3 (±2.6)	2 yrs: 84.6 (±2.9)	58.4 (±3.9)	1 yr: 72.8 (±3.0)	2 yrs: 79.3 (±3.5)						47.2 (±4.3)	1 yr: 78.5 (±3.2)	2 yrs: 78.5 (±3.6)				40.2 (±NR)	1 yr: 78.6 (±NR)	2 yrs: 78.8 (±NR)		
	Control	54.6 (±3.7)	1 yr: 84.8 (±2.9)	2 yrs: 87.9 (±3.1)	46.8 (±4.2)	1 yr: 79.5 (±3.1)	2 yrs: 87.5 (±3.7)						40.7 (±4.8)	1 yr: 82.1 (±3.6)	2 yrs: 85.4 (±4.0)				40.1 (±NR)	1 yr: 79.8 (±NR)	2 yrs: 82.2 (±NR)		
		p= 0.69	p= 0.44	p=0.14		p=0.13								p= 0.48		p= 0.21		p= 0.73				p= 0.46	
Iannotti 2016	Restore®																						
	Control							42 (±NR)				14 mnths: 83 (IQR 70-92)											
								34 (±NR)				14 mnths: 91 (IQR 81-99)	p=0.07										
Lamas, 2019	MSCs + OrthADAPT™			44.5 (±10.8)		72 (±15.1)																	
	OrthADAPT™			51.2 (±9.0)		65.5 (±18.7)																	
p=NR																							
Leuzinger 2016	Graftjacket®			47.3 (±7.3)		6 mnths: 81.4 (±11.4)																	
	Artelon®			46.2 (±9.6)		6 mnths: 81.3 (±11.1)																	
	Restore®			41.0 (±9.6)		6 mnths: 78.5																	

				(±12.3)									
				p= NR									
Cai, 2018	Collagen Matrix	37.3 (±6.5)	6 mnths: 77.1 (±4.2) 12 mnths: 87.1 (±3.2)	2 yrs: 90.8 (±3.5)						8.7 (±2.6)	6 mnths: 24.6 (±3.1) 12 mnths: 28.1 (±1.9)	2 yrs: 30.0 (±1.6)	
	Control	38.1 (±6.1)	6 mnths: 74.6 (±6.0) 12 mnths: 84.9 (±4.2)	2 yrs: 89.9 (±3.2)						7.9 (±2.2)	6 mnths: 23.4 (±2.6) 12 mnths: 26.9 (±2.1)	2 yrs: 29.4 (±1.9)	
		6mnths; p= 0.02, 12mnths; p=0.0035			p=0.18					6mnths; p=0.033 12mnths; p=0.0022			p=0.052

Non-Randomised Comparative Studies

Ciampi 2014	Repol Angimesh									10.9 (± 1.5)	2 mnths: 19.1 (± 2.0)	36 mnths: 24.6 (± 3.2)	
	Tutopatch									10.4 (± 1.2)	2 mnths: 11.4 (± 1.5)	36 mnths: 14.7 (± 2.0)	
	Control									10.7 (± 1.1)	2 mnths: 11.3 (± 1.5)	36 mnths: 14.9 (± 2.0)	
										p<0.001 †			

Flurry 2018	DX reinforcement matrix + PRP	53.8 (±14.1)	6 mnths: 29.4(±16.1)	2 yrs: 44.9 (±16.1)	61.9 (±11.4)	6 mnths: 12.5(±12.7)	2 yrs: 24.9 (±11.0)	31.1 (±6.8)	6 mnths: 10.2(±7.7)	2 yrs: 15.9 (±7.7)			
	Control	49.6 (±16.5)	6 mnths: 34.8 (±18.8)	2 yrs: 40.7 (±23.5)	52.4 (±16.4)	6 mnths: 20.6(±15.0)	2 yrs: 27.5 (±16.5)	29.5 (±5.7)	6 mnths: 12.6(±6.1)	2 yrs: 14.7 (±5.4)			
		p=0.35		p=0.53	p=0.08		p=0.58	p=0.29		p=0.58			

Gilot 2015	Arthroflex®	63.8 (±13.8)	12 wks: 60.6 (±8.3) 24 wks: 64.3 (±7.8)	96 wks: 88.9 (±4.8)								54 (±8)	12 wks: 52 (±6) 24 wks: 81 (±12)	96 wks: 84(±4)
	Control	60.3 (±9.5)	12 wks: 57.6 (±8.8) 24 wks: 60.4(±10.1)	96 wks: 72.6 (±11.9)									58 (±5)	12 wks: 59 (±8) 24 wks: 64 (±6)
		p=0.59; p=0.08		p= 0.048								p=0.36; p=0.05 p= 0.04		

Ito 2003	Fascia Lata												
	Control												

Jeon 2017	Biceps tendon	52.8 (±10.6)	12 wks: 60.1 (±15.8) 24 wks: 76.3 (±10.6)	29 mnths: 88.2 (±6.9)	43.2 (±9.9)	12 wks: 54.9 (±12.8) 24 wks: 72.2 (±12.8)	29 mnths: 86.8 (±6.2)						
	Control	53.0 (±11.8)	12 wks: 63.0 (±10.2) 24 wks: 75.7 (±11.5)	29 mnths: 87.4 (±7.2)	44.3 (±11.3)	12 wks: 56.1 (±10.8) 24 wks: 71.6 (±9.7)	29 mnths: 84.0 (±7.9)						
		p=0.901			p=0.742								

Giannotti 2014	Zimmer® Collagen Repair Patch	38 (±NR)	34 mnths: 79 (±NR)	42 (±NR)	34 mnths: 73 (±NR)																
		p= NR		p= NR																	
Gouk 2019	Graftjacket®			NR	48.2 (±22.1)	NR	37.2 (±12.4)														
		p=NR		p=NR																	
Gupta 2012	Graftjacket®	66.6 (±NR)	3 yrs: 88.7 (±NR)																		
		p= 0.0003																			
Gupta 2013	Conexa™	62.7	32 mnths: 91.8 (±13.3)																		
		p= 0.0007																			
Hirooka 2002	Gore-tex® PTFE																				
Johnson 2019	Graftjacket®				41mnths: 82.9 (70-100)		41mnths: 46.2 (41-48)														
		p=N/A																			
Lederman 2016	Conexa™	48.7 (±20.2)	1 yr: 85.4 (±18.4)	2 yrs: 90.4 (±15.3)	45.4 (±15.2)	1 yr: 68.7 (±11.3)	2 yrs: 71.7 (±9.6)		5.0 (±2.6)		2 yrs: 10.6 (±2.2)										
		p< 0.0001		p< 0.0001		p< 0.0001		p< 0.0001		p< 0.0001		p< 0.0001									
Lenart 2015	X-repair	32.8 (±9.5)	18 mnths: 74.2 (±5.0)					50.9 (±4.2)	18 mnths: 77.6 (±5.3)												
		p= 0.0001		p< 0.005																	
Malcarney 2005	Restore®																				
Marberry 2012	Artelon®		17.1 (±6.4)	1 yr: 67.1 (±11.6)														34(±18)	1 yr: 86 (±12)		
		p= 0.002		p= 0.002																	
Metcalf 2002	Restore®								NR	NR	9.3 (±NR)	24 mnths: 19.9 (±NR)									
		p= 0.01		p= 0.01																	
Modi 2013	Graftjacket®				26 (8-40)	1 yr: 42 (21-48)															
		p=0.001																			
Moore 2006	Cadaveric										12.1 (±NR)	31 mnths: 26.1 (±NR)									
		p< 0.001																			

Nada 2010	Dacron			46.7 (39-61)	36 mnths: 84.5 (52- 96)														
p< 0.001																			
Neuman n 2017	Conexa™	NR		50 mnths: 87.8															
p=NR																			
Petrie 2013	LARS™					46.7 (±NR)	3.3 yrs: 30.6 (±NR)												
p<0.0001																			
Petri 2016	Arthroflex®	64.5 (±10.0)		2.5 yrs: 86.0(±12 .3)															
p= 0.005																			
Petriccio lo 2013	SportMesh™					47.0 (±NR)	23 mnths: 69.0 (±NR)												
p= NR																			
Phipata nakul 2009	Restore®	36.3 (±NR)		26 mnths: 71.8 (±NR)													13.9 (±NR)	26 mnths: 25.7 (±NR)	
p< 0.01										p< 0.01									
Proctor 2014	X-Repair	26 (±NR)	3 mnths: 57 6 mnths: 68 12 mnth: 71	42 mnths: 70 (±NR)															
p< 0.05*					p< 0.05*														
Rhee 2008	Biceps tendon				48.4 (8-70)	32 mnths: 81.8 (37-96)				4.2 (1-8)	32 mnths: 10.2 (8-12)	12.5 (6-19)	32 mnths: 31.1 (9-35)						
p< 0.001										p< 0.001									
Rotini 2011	Acellular Human Dermal Matrix				64 (55-75)	>1 yr: 88 (77-95)													
p= NR																			
Sano 2009	Biceps tendon																		
Scheibel 2007	Periosteum				51.8 (25-68)	14 mnths: 80.9 (73-89)				4.5 (1-8)	14 mnths: 10.7 (8-12)								
p< 0.001										p< 0.001									
Schlegel 2017	Collagen Sheet	57.0 (±3.2) [¶]	3mnths: 73.9 (±3.2) [¶]	1 yr: 89.1 (±2.8) [¶]	57.1 (±2.8) [¶]	3mnths: 62.3 (±5.2) [¶]	1 yr: 81.4 (±2.2) [¶]												
p= 0.0001		p<0.0001		p=0.122		p<0.0001													
Sclamberg 2004	Restore®	60.3 (40-75)		>6mnths: 58.4 (30-95)															

p= 0.70											
Sears 2012	Graftjacket® Tissuemend Conexa™		4.2 yrs: 67.2 (±27.9)								
p=NR											
Smolen 2020	Pitch-Patch		36.5 (±16.4)	22 mnths: 81.2 (±9.6)	52 mnths: 83.4 (±10.8)						
p<0.001				p<0.005							
Venouzi ou 2013	Graftjacket®	23.8 (15-34)	30 mnths: 72.3 (52-94)								
p= 0.001											
Wong 2010	Graftjacket®	NR	>2 yrs: 84.1 (±NR)					18.4 (±NR)	>2 yrs: 27.5 (±NR)	NR >2 yrs: 75.2 (±NR)	
			p= NR							p< 0.001	p= NR

Supplementary Table 5 | Risk of re-tear and complications

Study	Safety Population, n	Recurrence of rotator cuff tears (%)					Complications (%)										
		Definition	Imaging	Time of imaging, months (range)	Absolute risk of re-tear %	p-value	Reported? (Yes/No)	Superficial Infection, n(%)	Deep Infection, n(%)	Inflammatory Response, n(%)	Other, n(%)						
Randomised Comparative Studies																	
Avanzi 2019	Conexa®	38	Interruption in tendon continuity	MRI	24 (NR)	2	<0.001	Yes	0 (0)	0 (0)	0 (0)	0 (0)					
	Control	30											40	0 (0)	0 (0)	0 (0)	0 (0)
Barber 2012	Graftjacket®	22	Incomplete excursion of the repaired tendon to the greater tuberosity with gadolinium leakage.	MRA	14.5 (12-14)	15	<0.01	Yes	0 (0)	0 (0)	0 (0)	Shoulder Bursitis 1(5)					
	Control	20											60	2(10)	0 (0)	0 (0)	Biceps Rupture, 1(5) Post-traumatic fibrosis, 1(5)
Byrant 2016	Restore®	34	>5mm increase in size of any immediate postoperative defect	MRA	12 (NR)	53	0.33	Yes	0 (0)	1(3)	0 (0)	Biceps Rupture, 1(3) Unexplained fever, 2(6)					
	Control	28											65	1(4)	0 (0)	0 (0)	Shoulder manipulation, 1(4)
Ianotti 2006	Restore®	15	Not healed: Tear size ≥ size on pre-op MRI	MRA	12 (NR)	73	0.11	Yes	0 (0)	0 (0)	2(13)	Wound erythema, 1(8)					
	Control	15	Partially healed: Smaller tear than preoperative MRI										40	0 (0)	0 (0)	0 (0)	0 (0)
Lamas 2019	MSCs + OrthADAPT™	5	NR	MRI	12 (NR)	60	NR	Yes	0 (0)	0 (0)	3(60)	0 (0)					
	OrthADAPT™	8											63	0 (0)	0 (0)	1(13)	0 (0)
Leuzinger 2016	Graftjacket®	29	Complete integrity of the repair with no tendon retraction	MRI	6 (NR)	23	0.08	Yes	0 (0)	0 (0)	1(3)	0 (0)					
	Artelon®	33											27	0 (0)	0 (0)	1(3)	0 (0)
	Restore®	30											39	0 (0)	0 (0)	1(3)	0 (0)
Cai 2018	Collagen Matrix	51	NR	MRI	24 (24-36)	34	0.02	Yes	0 (0)	0 (0)	0 (0)	0 (0)					
	Control	53											13	0 (0)	0 (0)	0 (0)	0 (0)
Non-Randomised Comparative Studies																	
Ciampi 2014	Repol Angimesh®	52	NR	US	12 (NR)	17	0.001†	Yes	0 (0)	0 (0)	0 (0)	0 (0)					

	Tutopatch®	49				51			0 (0)	0 (0)	0 (0)	0 (0)
	Control	51				41			0 (0)	0 (0)	0 (0)	0 (0)
Flurry 2018	DX reinforcement matrix + PRP	18	Sugaya classification grades 4 and 5 were considered re-tears * at 2 years if a 6 month US had showed an intact or only partially ruptured tendon	MRI	24 (NR)	20	0.096	Yes	0 (0)	0 (0)	0 (0)	Nerve injury 1(6) Bursitis 2(11)
	Control	20					50			0 (0)	0 (0)	0 (0)
Gilot 2015	Arthroflex®	20	NR	US	24 (NR)	10	0.048	Yes	1(5)	0 (0)	0 (0)	0 (0)
	Control	15				26			0 (0)	0 (0)	0 (0)	0 (0)
Ito 2003	Fascia Lata	30	NR	MRI	NR	0	NR	Yes	0 (0)	0 (0)	0 (0)	0 (0)
	Control	17				18			0 (0)	0 (0)	0 (0)	0 (0)
Jeon 2017	Biceps tendon	31	Complete tendon detachment from the footprint of the greater tuberosity or loss of continuity in the midsubstance portion	MRI	6 (NR)	32	0.55	No	-	-	-	-
	Control	33					39			-	-	-
Maillot 2018	Conexa™	11	N/A	N/A	N/A	N/A	N/A	Yes	0 (0)	1(9)	0 (0)	Shoulder stiffness, 4(4)
	Repair alone	12							1(8)	0 (0)	0 (0)	0 (0)
	Debridement	9							0 (0)	0 (0)	0 (0)	0 (0)
Mori 2013	Fascia Lata	24	High signal intensity or tendon discontinuity on ≥1 T2-weighted image	MRI	NR	21	0.015	Yes	0 (0)	0 (0)	0 (0)	0 (0)
	Control	24					42			0 (0)	0 (0)	0 (0)
Mori 2015	Fascia Lata + grade 1-2 infraspinatus atrophy	26	High signal intensity or tendon discontinuity on ≥1 T2-weighted image (complete defect) or insufficient thickness (partial defect)	MRI	NR	27	<0.001	Yes	0 (0)	0 (0)	0 (0)	0 (0)
	Fascia Lata + grade 3-4 infraspinatus atrophy	19					89			0 (0)	0 (0)	0 (0)
Tempelaere 2017	Quadriceps tendon	23	N/A	N/A	N/A	N/A	N/A	Yes	0 (0)	0 (0)	0 (0)	Knee pain, 12(52) Patellar fracture, 2(8) Quads tendon tear, 1(4) Nerve injury, 1(4) Knee Stiffness, 1(4)

	Control	27							0 (0)	0 (0)	0 (0)	0 (0)
Veen 2020	Long head of biceps	4	NR	MRI	12 (NR)	100	NR	No	-	-	-	-
	Non-operative	5				NA			-	-	-	-
Vitali 2015	Repol Angimesh®	60	NR	MRI	12 (NR)	15	NR	Yes	0 (0)	0 (0)	0 (0)	0 (0)
	Control	60				40			0 (0)	0 (0)	0 (0)	0 (0)
Walton 2007	Restore®	15	Thickness of supraspinatus immediately medial to insertion. 0mm if re-torn.	MRI	24 (NR)	60	NR	Yes	0 (0)	0 (0)	4(27)	0 (0)
	Control	16				58			0 (0)	0 (0)	0 (0)	0 (0)
Yoon 2016	Allocover™	21	Sugaya classification grades 4 and 5 were considered re-tears [†]	MRI	12 (NR)	19	0.036	Yes	0 (0)	0 (0)	0 (0)	0 (0)
	Control	54				46			0 (0)	0 (0)	0 (0)	0 (0)
Non-comparative studies												
Agrawal 2006	Allopatch®	14	Sugaya classification grades 4 and 5 [†]	MRI	16.8 (12-24)	14	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Audenaert 2006	Mersilene®	41	NR	US	NR	7	N/A	No	-	-	-	-
Badhe 2008	Zimmer® Collagen Repair Patch	10	An identifiable gap between the greater tuberosity and the graft	US/MRI	54 (36-60)	20	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Bektafieri 2010	Coracromial ligament	46	N/A	N/A	N/A	N/A	N/A	No	-	-	-	-
Bond 2008	Graftjacket®	16	NR	MRI	12 (NR)	19	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Burkhead 2007	Graftjacket®	17	NR	MRI/CTA	14 (NR)	25	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Cho 2014	Permacol™	5	Fluid-equivalent signal or discontinuity of the rotator cuff in ≥1 T2- weighted images	MRI	8 (6-12)	20	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Consigliere 2017	DX reinforcement matrix	10	N/A	N/A	N/A	N/A	N/A	No	-	-	-	-
Encalada-Diaz 2011	Polycarbonate polyurethane patch	10	NR	MRI	12 (NR)	10	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Flury 2012	Graftjacket® or Arthroflex®	8	NR	US/MRI	6 (NR)	Full: 13 Partial: 25	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Giannotti, 2014	Zimmer® Collagen Repair Patch	9	NR	US/MRI	34 (30-45)	0	N/A	No	-	-	-	-

Gouk, 2019	Graftjacket®	7	Any re-tear of the cuff or loss of continuity of the graft at any point	MRI	6 (NR)	86	N/A	No	-	-	-	-
Gupta 2012	Graftjacket®	24	<i>Not intact:</i> A full thickness defect at the graft-tendon or graft-humerus interface <i>Partially intact:</i> A partial thickness defect at the graft-tendon or graft-humerus interface.	US	36 (NR)	Full:0 Partial: 26	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Gupta 2013	Conexa™	26	As above (Gupta 2012)	US	32 (24-40)	Full: 5 Partial: 22	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Hirooka 2002	Gore-tex® PTFE	27	NR	Arthrography	NR	11	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Johnson 2019	Graftjacket®	13	NR	MRI	35 (9-56)	0	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Lederman 2016	Conexa™	61	<i>Complete:</i> ≥80% of the size of the original tear in the sagittal plane <i>Partial:</i> Tears between 1 cm and 80% of original size	MRI	12 (NR)	Full: 15 Partial: 34	N/A	Yes	1(2)	0 (0)	0 (0)	Superficial haematoma, 1(2)
Lenart 2015	X-Repair	13	NR	MRI	18 (14-20)	62	N/A	No	-	-	-	-
Malcarney 2005	Restore®	25	NR	Arthroscopy	NR	16	N/A	Yes	0 (0)	0 (0)	4(16)	0 (0)
Marberry 2012	Artelon®	17	NR	MRI	NR	18	N/A	Yes	1(6)	1(6)	0 (0)	0 (0)
Metcalf 2002	Restore®	12	NR	MRI	NR	8	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Moore 2006	Cadaveric	32	NR	MRI	34 (3-124)	100	N/A	Yes	0 (0)	1(3)	1(3)	0 (0)
Modi 2013	Graftjacket®	61	NR	MRI	12	Full: 0 Partial: 17	N/A	Yes	0 (0)	1(2)	0 (0)	Persistent pain, 1(2)
Nada 2010	Dacron	21	NR	MRI	36 (30 – 46)	19	N/A	Yes	0 (0)	1(5)	0 (0)	0 (0)
Neumann 2017	Conexa™	60	<i>Not intact:</i> Full thickness defect at graft-tendon or graft-humerus interface <i>Partial:</i> less than full thickness defect at graft-tendon or graft-humerus interface	US	50 (24 -63)	Full: 5 Partial: 3	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Petrie 2013	LARS™	31	N/A	N/A	N/A	N/A	N/A	Yes	0 (0)	0 (0)	0 (0)	Persistent pain, 1(3) Shoulder stiffness, 1(3)

Petri 2016	Arthroflex®	12	NR	MRI	9.9 (0.3-26.3)	17	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Petricciolo 2013	SportMesh®	10	(1) Bare area between the edge of subscapularis and the bicipital groove and; (2) Coexistence of fluid in the subacromial subdeltoid bursa and/or fluid in the long head of biceps sheath	US	23 (12-34)	10	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Phipatanakul 2009	Restore®	11	Partially intact: Smaller tear than preoperative imaging. Otherwise not stated.	MRA	25 (14-38)	50	N/A	Yes	1(9)	0 (0)	0 (0)	Skin reaction, 3(27)
Proctor 2014	X-Repair	18	NR	US/MRI	12	17	N/A	No	-	-	-	-
Rhee 2008	Biceps tendon	31	Fluid-equivalent signal or non-visualisation of supra-, infra- or subscapularis tendon in ≥1 T2 weighted images	MRI	NR	Full: 21 Partial: 14	N/A	Yes	0 (0)	0 (0)	0 (0)	'Popeye' biceps deformity, 2(7)
Rotini 2011	Acellular Human Dermal Matrix	5	NR	MRI	12	20	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Sano, 2010	Biceps tendon	14	Sugaya classification > grades 4 were considered re-tears [†]	MRI	28 (12-51)	7	N/A	Yes	0 (0)	0 (0)	0 (0)	'Popeye' biceps deformity, 1(7)
Scheibel, 2007	Periosteum	20	Fluid equivalent signal in the way of a tendon, discontinuity or retraction	MRI	12	20	N/A	Yes	0 (0)	1(5)	0 (0)	Ectopic ossification, 4(20)
Schlegel 2017	Collagen sheet	33	NR	MRI	3 + 12 (NR)	N/A	N/A	Yes	1(3)	0 (0)	0 (0)	Persistent pain ,1(3) Cardiac event, 1(3) Possible inflammatory response, 1(3)
Sclamberg 2004	Restore®	11	NR	MRI	(6-12)	90	N/A	No	-	-	-	-
Sears 2014	ECM	16	NR	US/MRI	50 (NR)	63	N/A	No	-	-	-	-
Smolen 2020	Pitch-Patch	50	Incomplete coverage of the debrided footprint	MRI	22 (9-35)	14	N/A	Yes	0 (0)	0 (0)	0 (0)	Frozen Shoulder 6(12) Symptomatic crepitus 1(2)
Venouziou 2013	Graftjacket®	14	N/A	N/A	N/A	N/A	N/A	Yes	0 (0)	0 (0)	0 (0)	0 (0)
Wong 2010	Graftjacket®	45	N/A	N/A	N/A	N/A	N/A	Yes	0 (0)	1(2)	0 (0)	0 (0)

Supplementary Table 6 | Pain scores

Study		Pain Scores									
		VAS, Mean (SD or range)					Other pain scales, Mean (SD or range)				
Baseline	Intermediate	p-value	Final [†]	p-value	Baseline	Intermediate	p-value	Final [†]	p-value		
Randomised Comparative Studies											
Iannotti 2006	Restore®						12.5 [‡] (±NR)			14 mnths 25 [‡] (±NR)	0.18
	Standard Repair						12.0 [‡] (±NR)			14 mnths 29 [‡] (±NR)	
Lamas 2019	MSCs + OrthADAPT™	8.1 (±0.6)			2.8 (±2.7)	NR					
	OrthADAPT™	8.2 (±0.4)			2.2 (±1.1)						
Non-Randomised Comparative Studies											
Ciampi 2014	Repol Angimesh	8.3 (±1.0)	2 mnths: 4.9 (±0.9)	<0.001 [‡]	36 mnths: 3.3 (±1.1)	<0.001 [‡]					
	Tutopatch	8.3 (±1.1)	2mnths: 6.45 (±1.0)	0.01 [‡]	36 mnths: 4.1 (±1.0)	<0.001 [‡]					
	Standard Repair	8.2 (±1.1)	2 mnths: 7.0 (±1.1)	<0.001 [‡]	36 mnths: 3.7 (±1.1)	<0.001 [‡]					
Gilot 2015	Arthroflex®	6.8 (±1.6)	12 wks: 5.3(±1.6)	12wks: 0.52	96wks: 1.3 (±1.2)	0.013					
	Standard Repair	6.9 (±1.1)	24 wks: 3.9(±1.6)	24 wks: 0.04	96wks: 4.1 (±1.1)						
			24 wks: 6.8 (±1.1)								
Ito, 2003	Fascia Lata (Cadaveric)						10.0*(±5.6)			2.9 yrs: 27.8*(±3.6)	<0.01 [‡]
	Standard Repair						9.2*(±2.9)			4.2 yrs: 28.3*(±3.3)	<0.005 [‡]
Jeon 2017	Biceps tendon	5.1 (±1.4)	12 wks: 3.7(±1.5)	NR	29mnths: 1.0 (±0.8)	0.892					
	Standard Repair	5.2 (±1.4)	24 wks: 2.2(±1.4)	NR	29mnths: 0.9 (±0.8)						

Maillot 2018	Conexa™	7.1 (±1.2)	24 wks: 2.1(±1.2) 12 wks: 3.5(±1.3)	12wks: 1.0 [*]	24 months: 0.6(±0.7)	1.0 [*]					
	Standard Repair	6.9 (±1.2)	12 wks: 3.0(±1.9) 24 wks: 1.6(±1.3)		24 months: 0.7(±0.8)						
	Debridement	7.2 (±0.8)	12 wks: 3.2(±1.2) 24 wks: 1.4(±1.2)	12wks: 1.0 [*] 24 wks: 1.0 [*]	24 months: 1.0(±0.8)	0.501 [*]					
Mori 2013	Fascia Lata	7.0 (±0.9)	12 mnths: 1.2 (±0.8)	NR	35 mnths: 0.3 (±0.6)	0.028					
	Standard Repair	7.0 (±1.0)	12 mnths: 1.8 (±1.7)		35 mnths: 1.2 (±1.5)						
Tempelaere 2017	Quadriceps tendon					5.5 [§] (0-14)	58 mnths: 11.9 [§] (3-15)	NS			
	Standard Repair					7.6 [§] (5 -13)	55 mnths: 12.6 [§] (5-15)				
Veen 2020	Long head of biceps	45.0 (30-70)	3 mnths: 56.3(20-80) 6 mnths: 37.5(10-65)	NR	12 mnths: 16.7 (10-20)	NR					
	Non-operative	60 (30-80)	3 mnths: 27(20-50) 6 mnths: 38(20-60)		12 mnths: 26 (10-80)						
Vitali 2015	Repol Angimesh	8.2 (±1.1)	3mnths: 4.9 (±0.9)	NR	36 mnths: 3.2(± 1.1)	Unclear					
	Standard Repair	8.4 (±1.0)	3 mnths: 6.9 (±1.1)		36 mnths: 3.7(± 1.0)						
Walton 2007	Restore®					NR	3 mnths: [¶] 9.9 (±1.6)	<0.01	NR	NR	
	Standard Repair					NR	3 mnths: [¶] 4.0 (±1.3)		NR		
Yoon 2016	Allocover™	6.0 (±1.9)	1 yr: 1.5 (±2.1)	0.95	2 yrs: 1.6 (±1.7)	0.68					
	Standard Repair	6.1 (±1.5)	1 yr: 1.6 (±1.8)		2 yrs: 1.8 (±1.9)						

Non-comparative studies

Agrawal 2012	Allopatch™					7.7 [§] (±NR)	1 yr: 13.6 (±NR)	0.008
Audenaert 2006	Mersilene®					1.3 [§] (±NR)	43 mnths: 13.1 [§] (±NR)	<0.001
Badhe 2008	Zimmer® Collagen Repair Patch					6.8 [§] (±NR)	4.5 yrs: 14 (±NR)	0.00003
Bond 2008	Graftjacket®					4.6 [†] (±NR)	26 mnths: 9.8 (±NR)	0.0001
Cho 2014	Permacol™	6.8 (±NR)			21 mnths: 0.8 (±NR)	0.041		
Consigliere 2017	DX reinforcement matrix	7.0 (±2)	3 mnths: 0.8(±0.8)	<0.05	6 mnths: 0.6 (±0.8)	<0.05		
Encalada-Diaz 2011	Polycarbonate polyurethane patch	5.7 (2 - 8)	6 mnths: 3.8(NR)	0.009	12 mnths: 2.6 (0 - 4)	<0.001		
Gupta 2012	Graftjacket®	5.4 (±NR)			3 yrs: 0.9 (±NR)	0.0002		
Gupta 2013	Conexa™	5.1 (±NR)			32 mnths: 0.4 (±1.0)	0.002		
Hirooka 2002	Gore-tex® PTFE					9.1*(±NR)	44 mnths: 27.7*(±NR)	<0.0001
Marberry 2012	Artelon®					4.5 [§] (±2.9)	1 yr: 11.6 [§] (±3.3)	0.002
Modi 2013	Graftjacket®	7.0 (4 - 10)			3.6 yrs: 0.8 (0-5)	0.001		
Moore 2006	Cadaveric					2.5 [#] (±NR)	31 mnths: 7.9 [†] (±NR)	<0.001
Nada 2010	Dacron	7.0 (5 - 8)			36 mnths: 1.0 (0 - 2)	<0.001		
Neumann 2017	Conexa™	4.0 (±2.5)			50 mnths: 1.0 (±1.6)	<0.001		
Petrie 2013	LARS™	7.7 (±NR)			3.3 yrs: 4.4 (±NR)	<0.0001		
Petri 2016	Arthroflex®					38.6 ^{§2} (±8.6)	2.5 yrs: 44.6 ^{§2} (±10.6)	0.506
Petricciolo 2013	SportMesh™	7.9 (±1.1)			23 mnths: 2.0 (±1.9)	NR		
Phipatanakul 2009	Restore®	6.6 (±NR)			26 mnths: 2.2 (±NR)	<0.01		
Rhee 2008	Biceps tendon	At rest: 2.0 (0-7)			32 mnths: 0.3 (0-5)	<0.001		
		On exercise: 6.6 (3-10)			32 mnths: 1.4(0-10)	<0.001		
Sano 2010	Biceps tendon					13.1*(±2.5)	28 mnths: 22.9*(±5.1)	0.002
Scheibel 2007	Periosteum					7.9 [§] (6-12.5)	14 mnths: 14.0 [§] (12-15)	<0.001
Schlegel 2017	Collagen Sheet	4.2 ^{§2} (±0.4) ¹²	3 mnths: 1.5 ^{§2} (±0.3) ¹²	<0.001	12 mnths: 0.6 ^{§2} (±0.2) ¹²	<0.0001		

Venouziou 2013	Graftjacket®	7.4 (4-9)	30 mnths: 1.7 (0-5)	0.001	
-------------------	--------------	-----------	------------------------	-------	--

Supplementary Table 7 | Quality of Life Scores

Study	Quality of Life Outcome Score														
	SF-12, Mean (±SD or range)					SF-36, Mean (±SD or range)					EQ-5D				
	Baseline	Intermediate	p-value	Final†	p-value	Baseline	Intermediate	p-value	Final†	p-value	Baseline	Intermediate	p-value	Final†	p-value
Randomised Comparative Studies															
Avanzi 2019	Conexa®														
	Standard Repair														
										64.7† (±21.2)	3 mnths‡: 16.4 (±15.8) 6 mnths‡: 7.3 (±8.0) 12 mnths‡: 7.1 (±8.8)	3mnths NS	2 yrs‡: 4.0 (±7.7)	NS	
										54.5† (±21.8)	3 mnths‡: 16.9 (±15.2) 6 mnths‡: 6.8 (±8.1) 12 mnths‡: 5.2 (±6.7)	6mnths NS 12mnth sNS	2yrs‡: 10.6 (±17.8)		
Bryant 2016	Restore®														
	Control														
						PCS: 40.1 (±1.3)	1 yr: 46.6 (±1.4)	PCS: 0.50	1 yr: 47.3 (±1.6)	PCS: 0.56					
						MCS: 48.8 (±2.2)	1 yr: 55.7 (±1.4)	MCS: 0.52	1 yr: 55.0 (±1.2)	MCS: 0.83					
						PCS: 40.5 (±1.5)	1 yr: 48.1 (±1.7)		1 yr: 48.7 (±1.7)						
						MCS: 52.8 (±2.4)	1 yr: 54.3 (±1.6)		1 yr: 55.0 (±1.2)						
Iannotti 2016	Restore®														
	Control														
						PCS: 50.3 (±NR)			14 mnths: NR	NS					
						MCS: 56.3 (±NR)			14 mnths: NR						
						PCS: 51.8 (±NR)			14 mnths: NR						
						MCS: 51.9 (±NR)			14 mnths: NR						
Non-Randomised Comparative Studies															
Flurry 2018	DX reinforcement matrix + PRP														
	Control														
										0.89 (±0.07)	6 mnths§: 0.05 (±0.09)	0.04	2 yrs: 0.07 (±0.10)§	0.14	
										0.79 (±0.23)	6 mnths§: 0.17 (±0.24)		2 yrs: 0.16 (±0.23)§		

Gilot 2015	Arthroflex®	PCS	29.2 (±6.4)	12 wks: 29.2 (±5.1) 24 wks: 36.2 (±4.4)	PCS: 12 wks: 0.68 24 wks: 0.05	96 wks: 42.6 (±10.8)	PCS: 0.05		
		MCS	42.2 (±12.1)	12 wks: 45.7(±10.8) 24 wks: 47.3 (±6.5)		96 wks: 64.1 (±9.3)	MCS: 0.04		
	Control	PCS	30.7 (±6.0)	12 wks: 30.3 (±5.7) 24 wks: 30.4 (±5.0)	MCS: 12 wks: 0.71 24 wks: 0.06	96 wks: 31.7 (±9.5)			
		MCS	43.1 (±8.2)	12 wks: 47.1(±11.8) 24 wks: 41.1 (±8.2)		96 wks: 42.9 (±10.8)			

Non-comparative studies

Encalada- Diaz 2011	Polycarbonate polyurethane patch	PCS	35.6 (±NR)	6 mnths: 42.5 (±NR)	0.03	12 mnths: 40.4 (±NR)	0.13		
		MCS	45.4 (±NR)	6 mnths: 53.1 (±NR)	0.10	12 mnths: 51.1 (±NR)	0.32		
Gupta 2012	Graftjacket®		48.8 (±NR)			3yrs: 56.8 (±NR)	0.03		
Gupta 2013	Conexa™		48.4 (±NR)			32 mnths: 56.6 (±6.1)	0.04		
Marberry 2012	Artelon®		NR			1 year: 'Positive change for physical compone nt'	NR		
Petri 2016	Arthroflex®	PCS	44.5 (±8.9)			2.8 yrs: 52.9 (±5.7)	0.005		
		MCS	NR			NR	NR		