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Fig. E-1

The patient is positioned prone for surgery.

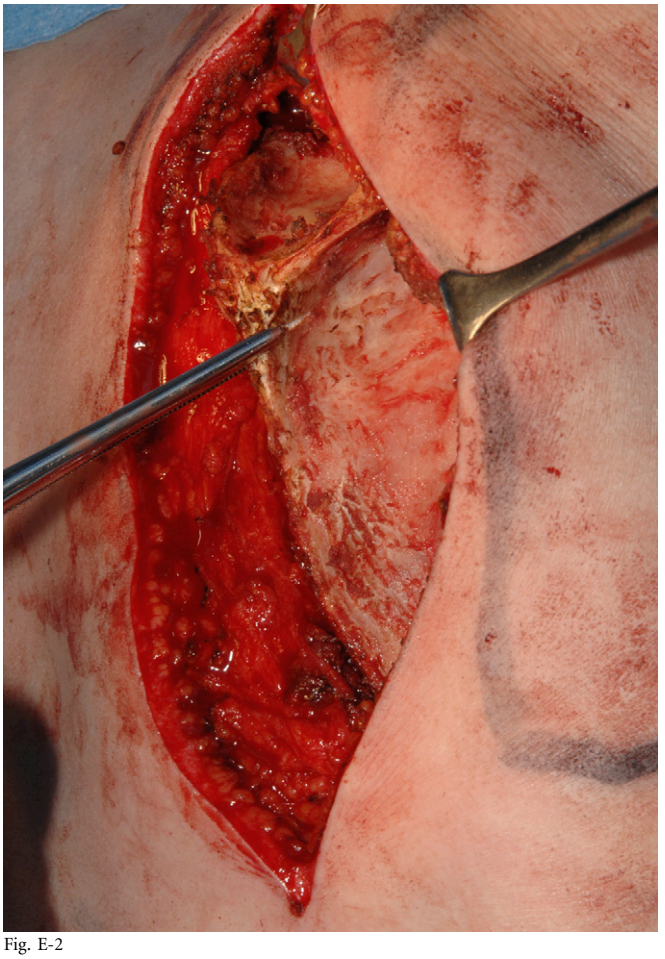


Fig. E-2

Exposure of the medial border of the scapula.

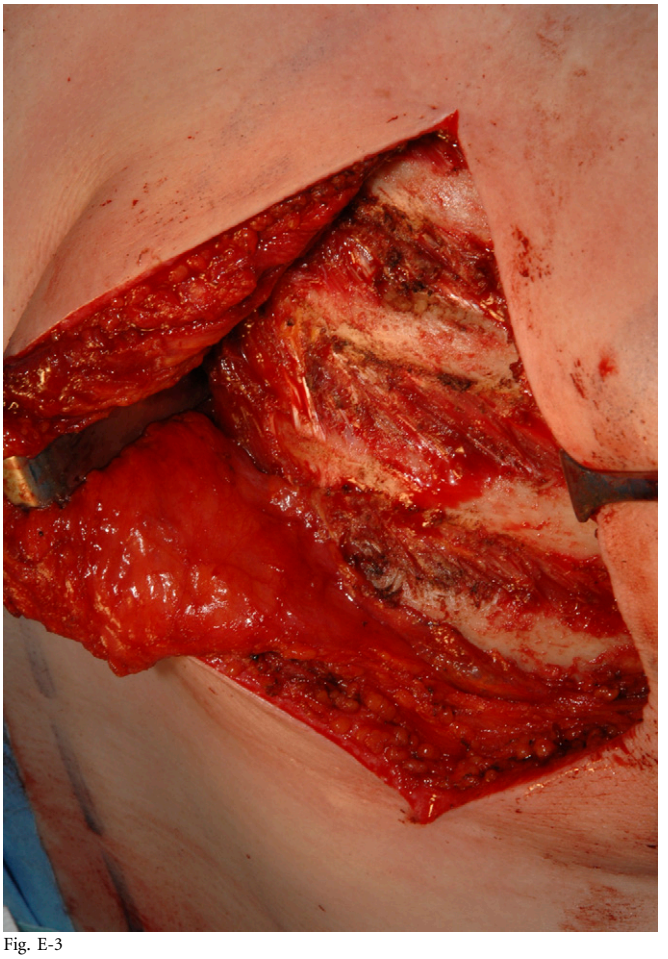


Fig. E-3

Exposure of four ribs.

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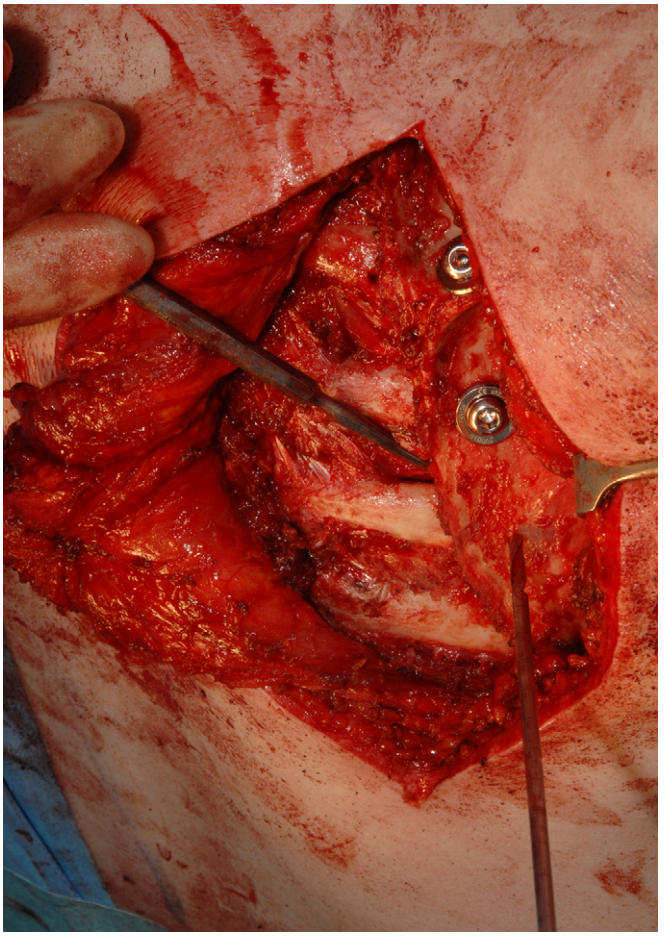


Fig. E-4

Positioning of the drill for the third hole with the previous two screws in place.

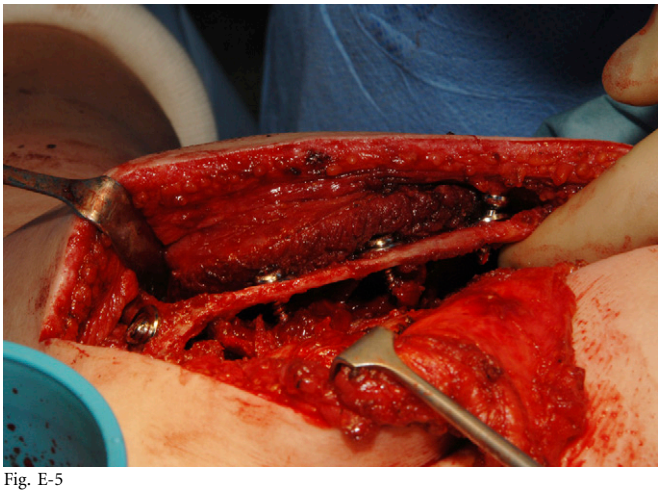


Fig. E-5

Packing of cancellous autograft after loosening of the screws.



Fig. E-6

The ''squared shoulders'' appearance.

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TABLE E-1 Patient Demographics

Patient	Shoulder	Sex	Age at Surgery *(yr)*	Side	Ribs Fixed	Type of Fixation	Bone Graft*	Comments
1	1	F	18	R	3	Screws	PIC	
2	2	F	17	R	3	Screws	PIC	
	3	F	19	L	3	Screws	PIC	
3	4	M	23	R	3	Screws	PIC	Failure due to noncompliance (removal of brace)
	4, revision	M	23	R	3	Plate and screws	PIC	
	5	M	24	L	3	Screws	PIC	
4	6	M	17	R	3	Screws	PIC	
	7	M	18	L	3	Screws	PIC	
5	8	M	19	R	3	Screws	PIC	
6	9	M	22	R	3	Screws	PIC	Nonunion; revised elsewhere, lost to follow-up
7	10	M	37	R	3	Screws	PIC	Failure due to noncompliance; revised; again noncompliant
	10, revision	M	37	R	3	Plate and screws	PIC	Failure due to noncompliance; lost to follow-up
8	11	M	30	R	3	Screws	PIC	
	12	M	30	L	3	Screws	PIC	
9	13	F	18	R	3	Screws	PIC	
10	14	M	37	L	4	Screws	PIC	
	15	M	38	R	4	Screws	PIC	
11	16	M	20	L	4	Screws	PIC	
	17	M	21	R	4	Screws	PIC	
12	18	M	31	R	3	Screws	PIC	
	19	M	32	L	4	Screws	PIC	
13	20	M	19	R	3	Screws	PIC	
	20, revision	M	20	R	4	Plate and screws	PIC + TCP	Revised successfully
	21	M	22	L	3	Screws	PIC	
	21, revision	M	23	L	5	Screws	PIC	Revised successfully
14	22	F	25	L	3	Screws	PIC	Lost to follow-up due to emigration but already had excellent early postop. outcome
15	23	F	37	R	3	Screws	PIC	
	24	F	39	L	3	Screws	PIC + supplemental TCP	
16	25	F	62	R	4	Screws	PIC	Died of acute myocardial infarction (unrelated)
17	26	M	29	R	4	Screws	PIC	
18	27	M	21	R	3	Screws	PIC	
	28	M	22	L	3	Screws	PIC	
19	29	M	25	L	3	Screws	PIC	

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TABLE E-1 (*continued*)

Patient	Shoulder	Sex	Age at Surgery *(yr)*	Side	Ribs Fixed	Type of Fixation	Bone Graft*	Comments
20	30	F	25	R	3	Screws	PIC	
	31	F	26	L	4	Screws	TCP	
21	32	M	19	R	3	Screws	TCP	
22	33	M	16	R	4	Screws	TCP	Deterioration of muscular function
23	34	M	31	L	4	Screws	TCP	Nonunion
	34, revision	M	32	L	4	Screws	TCP	Revised successfully; healed
24	35	F	37	R	4	Screws	TCP	

*PIC = posterior iliac crest autograft, and TCP = tricalcium phosphate bone graft substitute.

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TABLE E-2 Outcomes Other than Constant Score in Shoulders with Medium to Long-Term Follow-up

Patient	Shoulder	Follow-up *(mo)*	Elevation *(deg)*		Satisfaction		Complications		Other
			Preop.	Postop.	Preop.	Postop.	Early	Late	
1	1	172	60	100	2	8			
2	2	168	70	110	2	9			
	3	144	65	70	2	8			
3	4	169	60	160	1	10	Early revision (at one wk) due to screw pull-out after patient removed brace; good union after revision		
	5	174	60	160	1	10			
4	6	167	70	110	1	6			
	7	143	70	110	1	7			
5	8	127	60	130	1	10			
8	9	112	70	100	0	8			
	10	106	70	100	0	8			
9	11	108	60	130	1	10			
10	12	100	65	100	2	9			
	13	93	65	100	2	9			
11	14	99	70	130	0	9			
	15	93	70	130	0	9			
12	16	91	40	130	0	7			
	17	81	40	130	0	6	Superficial wound infection		
13	18	82	50	130	0	10		Revised (with plate and screws) because of fall 15 mo later (a large osseous structure from the previous surgery was found on the three ribs)	
	19	46	50	130	0	10		Painful nonunion; revised with screws at 15 mo	
15	20	74	50	130	1	10			
	21	38	50	130	0	8			
16	22	36	70	110	3	10			Planned contralateral side arthrodesis but died of unrelated acute myocardial infarction at 1 yr
17	23	66	70	130	3	8			
18	24	55	80	110	1	8	Pneumothorax		
	25	43	80	110	1	7			
19	26	48	80	130	2	6			

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TABLE E-2 (*continued*)

Patient	Shoulder	Follow-up *(mo)*	Elevation *(deg)*		Satisfaction		Complications		Other
			Preop.	Postop.	Preop.	Postop.	Early	Late	
20	27	38	80	110	0	10			
	28	31	80	110	0	10			
21	29	36	60	130	1	10			
22	30	30	70	70	4	4			Good fusion but severe deterioration of general muscular function
23	31	27	60	70	0	5	Nonunion; revised and healed		
24	32	24	70	110	1	9			
Mean			65	119	1.0	8.4			

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TABLE E-3 Constant Score in Shoulders with Medium to Long-Term Follow-up

		Overall Constant Score		Pain		Activities of Daily Living		Range of Motion		Strength	
Patient	Shoulder	Preop.	Postop.	Preop.	Postop.	Preop.	Postop.	Preop.	Postop.	Preop.	Postop.
1	1	30	60	8	15	8	19	14	26	0	0
2	2	26	61	9	14	3	11	14	32	0	4
	3	22	44	7	13	3	9	12	22	0	0
3	4	33	90	13	15	6	19	14	36	0	20
	5	29	90	10	15	5	19	14	36	0	20
4	6	26	51	7	10	5	13	14	20	0	8
	7	26	58	7	11	5	13	14	24	0	10
5	8	31	66	12	15	5	14	14	28	0	9
8	9	28	53	13	15	3	14	12	18	0	5
	10	28	52	13	15	3	14	12	18	0	5
9	11	31	64	13	15	2	15	16	27	0	7
10	12	31	59	10	15	4	12	17	27	0	5
	13	31	57	10	15	4	12	17	25	0	5
11	14	33	65	13	15	6	20	14	28	0	2
	15	31	65	13	15	4	20	14	28	0	2
12	16	23	59	5	10	4	13	14	28	0	8
	17	23	53	5	8	4	11	14	28	0	6
13	18	33	75	15	15	4	18	14	28	0	14
	19	33	73	15	15	4	18	14	28	0	12
15	20	17	56	7	12	2	16	8	24	0	4
	21	17	62	7	12	2	16	8	30	0	4
16	22	36	52	15	15	5	13	16	22	0	2
17	23	35	71	8	15	7	16	20	28	0	12
18	24	39	67	10	10	13	18	16	24	0	11
	25	41	68	13	13	12	15	16	28	0	8
19	26	40	63	9	15	9	14	22	26	0	8
20	27	35	62	6	11	13	13	16	28	0	10
	28	35	62	6	11	13	13	16	28	0	10
21	29	31	67	11	15	4	20	16	24	0	8
22	30	25	30	10	10	3	8	12	12	0	0
23	31	21	30	3	8	2	6	16	16	0	0
24	32	35	57	12	15	5	16	18	22	0	4
Mean		30	61	9.8	13.2	5.4	14.6	14.6	25.6	0	8

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TABLE E-4 Reports on Scapular Fixation for Facioscapulohumeral Muscular Dystrophy

Study	Functional Assessment Score	Technique	Patients, Shoulders	Preop. Shoulder Elevation *(deg)*	Fixation Method
Ketenjian, 1978[22]	—	Scapulopexy	3, 5	56	Fascia or synthetic strips
Giannini, 2006[21]	—	Scapulopexy	13, 26	70	Metal wires
Demirhan, 2009[2]	DASH, SFS*	Scapulodesis	13, 18	47.2	Metal wires
Ziaee, 2006[17]	—	Scapulodesis	6, 8	67.5	Plate and metal wires
Rhee, 2006[20]	UCLA score	Scapulodesis	6, 9	71	Plate and metal wires
Diab, 2005[18]	—	Scapulodesis	8, 11	75	Plate and metal wires
Berne, 2003[19]	—	Scapulodesis	31, 47	70	Plate and screws and metal wires
Andrews, 1998[15]	—	Scapulodesis	6, 10	56.5	Metal wires (2 per rib)
Twyman, 1996[14]	—	Scapulodesis	6, 12	63	Metal wires
Bunch, 1993[13]	—	Scapulodesis	12, 17	65	Metal wires (2 per rib)
Letournel, 1990[11]	—	Scapulodesis	9, 16	77	Wire-and-plate construct (through window in scapula)
Copeland, 1978[10]	—	Scapulodesis	6, 11	—	Screws and tibial struts
Copeland, 1999[1]	Constant score: mean 58 (range, 13-90)	Scapulodesis	10, 14	—	Screw fixation
Howard, 1961[24]	—	Scapulodesis	3, 4	—	Screws and tibial struts
Kocialkowski, 1991[12]	—	Scapulodesis	1, 2	90	Screws (2 per rib)
Alshameeri, 2011[16]	—	Scapulodesis	7, 8	59	Semi-tubular plate and metal wires
Current study, 2013	Constant score: mean 61 (range, 30-90)	Scapulodesis	24, 35	65	Screws

*SFS = Shoulder Functional Score.

TABLE E-4 (*continued*)

Mean Follow-up (Range)	Postop. Shoulder Elevation *(deg)*	Complications	
		Early	Late
34 mo (20-60)	87.6	1 partial loss of abduction after fall on shoulder at 3 wk	—
10 yr (3-18)	90	1 pneumothorax (resolved spontaneously)	1 wire breakage without trauma
35.5 mo (24-87)	103.8	—	2 nonunion requiring revision, 1 wire breakage without trauma
32.5 mo (14-55)	112.5	1 hemothorax	—
102 mo (56-118)	109	1 pleural effusion	—
75 mo (24-120)	139	—	2 plate removal because of pain
102 mo (12-257)	81	5 pneumothorax, 4 transient pleural effusion, 1 transient atelectasis, 2 transient neurological problems, 1 scapular fracture	4 rib fracture, 2 hardware removal, 1 nonunion
74 mo (28-120)	103	1 pneumothorax (resolved spontaneously)	1 wire breakage
49 mo (1-7 yr)	91	1 pneumothorax that was drained, 1 brachial plexus traction lesion, 1 rib stress fracture	1 revision for painful nonunion, 3 wire breakage
	125		
69 mo (24-133)	102	3 pneumothorax, 1 rib fracture	1 nonunion (not painful), 2 partial union (not painful)
11.3 yr (6 mo-22.2 years)	100	2 pleural effusion, 2 rib stress fracture	1 nonunion (revised)
16 yr (14 mo-44 yr)	103	1 hemothorax, 2 rib stress fracture, 1 early revision because of screw loosening (did not wear brace), 1 scapular fracture	1 revision for painful nonunion, 2 screw removal because of irritation
—	—	—	—
30 mo	100	—	—
17 mo (4 to 48)	98	2 hemothorax (1 thoracotomy)	2 plate removal because of pain, 1 scapular fracture
88 mo (24-174)	119	1 pneumothorax (conservative treatment), 2 pullout of fixation due to noncompliance, 1 superficial wound infection, 2 nonunion	1 traumatic scapular fracture (revised), 1 nonunion