

Table 1. Risk of Bias

Author/Year	Objective of study	Inclusion/Exclusion Criteria	Study Design	Data source	Reasons for plating	Site of plating	Reasons for plate removal	Statistical methods	Summary results	Follow-Up	Study limitations	Risk of Bias
Brown et al, 1989	X	X	X	X	X	X	X	X	X	X		10
Islamoglu et al, 2002	X		X		X	X	X		X	X		7
Murthy et al, 2005	X		X	X	X	X	X		X	X		8
Rallis et al, 2006	X		X	X	X	X	X		X	X		8
Dae-Kyun et al, 2007	X	X	X	X	X		X	X	X	X		9
O'Connell et al, 2009	X		X	X	X	X	X		X	X		8
Pan et al, 2013	X	X	X	X	X	X	X	X	X	X	X	11
Liandro et al, 2015	X	X	X	X	X	X	X		X	X		9
Gorrela et al, 2019	X		X	X	X	X	X		X	X		8
Sukegawa et al, 2020	X	X	X	X	X	X	X	X	X	X	X	11
Sadiq et al, 2021	X		X	X	X	X	X		X	X		8

Table 2. Characteristics of the selected studies

Author/ Year	Country	# of pts	Age range (yrs)	M:F ratio	Site of plate placement	Type of plates	# of plates	Surgical approach	Reasons for plate removal	Duration Between insertion & removal	Site of plate removal
O'Connell et al, 2009	Ireland	434	3-72	4:1	<ul style="list-style-type: none"> • Mandible, • Orbito-zygomatic complex, • Maxilla 	Titanium miniplates	800	Intraoral	<ul style="list-style-type: none"> • Infection, • Tooth extraction • Plate exposure, • Fibrous union, • Temperature • Plate fracture, • Implant placement, • Prior to ortho surg, • Palpable plate, • Pediatric patient 	2.5-68 mon average:19m	<ul style="list-style-type: none"> • Le Fort I • Le Fort II • Zygomatic complex
Brown et al, 1989	UK	62	15-80	-	<ul style="list-style-type: none"> • Mandible • Ramus • Angle • Mental/Symphysis • Maxilla & midface • Buttress • Piriform fossa 	Stainless steel	105	Intraoral	<ul style="list-style-type: none"> • Infection, Pain 	3 - 24months	
Islamoglu et al,2002	Turkey	66	6-64	51:15 (17:5)	<u>Mandible</u> <ul style="list-style-type: none"> • Symphysis • Body • Angle <u>Maxilla & midface</u> <ul style="list-style-type: none"> • Le Fort I • Le Fort II • Le Fort III • Inferior orbital rim • Zygomatic complex • Zygomaticofrontal 	Titanium	296	Intraoral Extraoral	<ul style="list-style-type: none"> • Infection, • Extrusion, • Facial deformity, • Pain, • Malunion, • Plate fracture. 	3-14 months	
Llandro et al, 2015	UK	216	17-69	91:9	<ul style="list-style-type: none"> • Zygomatic-complex 	Titanium	307	Intraoral extraoral	<ul style="list-style-type: none"> • Infection, • Exposure 	111-972 days 180 days	<ul style="list-style-type: none"> • Zygomatic complex
Murthy et al, 2005	USA	76	14-71	62:14 (31:7)	<u>Mandible</u> <ul style="list-style-type: none"> • Ramus • Angle • Body • Symphysis <u>Maxilla & midface</u>	Titanium	163	Intraoral extraoral	<ul style="list-style-type: none"> • Infection 	No average	<ul style="list-style-type: none"> • Panfacial • Midface • Zygoma • Blowout • Mand. angle

					<ul style="list-style-type: none">• Frontal• Nasal• Frontozygomatic• Zygoma• Infraorbital rim• Piriform area• Zygomatic buttress						<ul style="list-style-type: none">• Mand. ramus• Mand. symphysis
Pan et al, 2013	China /India	156	12-60	128:28 (32:7)	Mandibular <ul style="list-style-type: none">•Body•Symphysis/parasym•Angle•Condyle Maxilla & midface <ul style="list-style-type: none">• Zygomatic buttressFrontozygomatic• Infraorbital rim• NOE/frontal bone• Pyriform aperture	Titanium	384	Intraoral extraoral	<ul style="list-style-type: none">• Infection• wound dehiscence,• Reconstruction• Growth,• Plate exposure,• Pain,• Palpable plates,• Heat/cold• Dental or nerve damage,• Broken hardware,• Prosthodontic	0-36 months	<ul style="list-style-type: none">• Mandibular fracture• ZMC• Maxillary• Frontal bone/NOE complex
Rallis et al, 2006	Greece	280	17-75	20:7	<u>Maxilla & midface</u> <ul style="list-style-type: none">•Frontal bone•Frontozygomatic•Frontonasal suture•Infraorbital rim•Zygomatic arch•Anterior wall of the antrum• Zygomatic buttress Mandible <ul style="list-style-type: none">• Ramus + condyle• Ext oblique ridge• Angle• Body of mandible• Mental area	Titanium	599	Extraoral	<ul style="list-style-type: none">• Infection,• Exposure,• Patient's request, Palpation,• Re-operation,• Nonunion,• Plate displacement	0.5 - 36 months Average 11.5 months	

Sukegawa et al, 2020	Japan	158	8-91	112:46 (56:2)	Maxilla & midface <ul style="list-style-type: none"> • Zygomatic buttress • Pyriform aperture • Infraorbital rim • Frontozygomatic Mandible <ul style="list-style-type: none"> • Condyle • Symphysis • Angle • Parasymphysis • Body 	Titanium	440	Intraoral and extraoral	<ul style="list-style-type: none"> • Infection • wound dehiscence • Plate exposure, • Broken hardware, • Palpable plates, • Screw loosening, • Patient's request, • Growth, • Teeth extraction, • Prosthodontic 	258 days	Maxilla & midface Zygomatic buttress Pyriform aperture Infraorbital rim Frontozygomatic Mandible Condyle Symphysis Angle Parasymphysis Body
Gorrela et al, 2019	India	234	14-59	172:62 (86:3)	<u>Mandible</u> <ul style="list-style-type: none"> • Parasymphysis • Angle • Condyle • Body Maxilla & zygomatic complex	Stainless steel	437	Intraoral	<ul style="list-style-type: none"> • Infection • Dehiscence • Loose plates • Palpable plates • Patient request • Non-union 		-
Dae-Kyun et al, 2007	Korea	419	Mean: 41.4	340:79		Titanium Absorbable	609	Intraoral	<ul style="list-style-type: none"> • Infection • dehiscence • Palpable • Patients preference • 2nd operation 	<3 months- >3 years	Cranial Facial Mandibular Combined
Sadiq et al, 2021	Pakistan	139	21-63	30:2 (15:1)	<u>Mandible</u> <ul style="list-style-type: none"> • Angle • Symphysis • Parasymphysis • Body • Condyle <u>Maxilla & midface</u> <ul style="list-style-type: none"> • Zygomaxilla • Frontozygomatic • Body • Arch 	Titanium	78	Intraoral Extraoral	<ul style="list-style-type: none"> • Infection • Sensitivity + pain • Palpability • Fracture of plate • Cancer phobia 	3-36 months	-
Total	-	2240	6-91		-	-	4218	-	-	0.5 months->3 yrs	-

Table 3. location and indications for plate removal

Author/Year	Number of plates	Indications for plate removal										Total No (%)
		Infection	Tooth Extraction	Plate exposure	Prosthetic rehabilitation	Pain	Plate fracture	Palpable plate	Loose fixation device	Patients preference.	Other reasons	
Brown et al, 1989	105	14	-	-	-	4	-	-	-	-	-	N= 18 17.14%
Islamoglu et al, 2002	296	6	-	-	-	3	1	-	-	-	Malunion: 2 Extrusion: 5 Facial deformity: 4	N= 21 7.095%
Murthy et al, 2005	163	6	-	-	-	-	-	-	-	-	-	N= 6 3.680%
George Rallis et al, 2006	599	9	-	8	-	-	-	7	-	8	Re-operation: 2 Non-union: 2 Plate displaced: 1	N= 37 6.18%
Dae-Kyun et al, 2007	609	26	-	-	-	-	-	5	-	4	2 nd operation - 6	N= 41 6.73%
O'Connell et al, 2009	800	12	7	2	2	-	1	1	-	-	Fibrous union: 2 Temp conduction: 1 Prior to orthg. surgery: 1 Peds patient: 2	N= 31 3.88%
Pan et al, 2013	384	16	-	1	6	6	-	1	-	-	Cold intolerance: 1 Plate Failure: 2 Dental/nerve damage: 2	N= 35 9.11%
Llandro et al, 2015	307	3	-	5	-	-	-	-	-	-	-	N= 8 2.60%
Gorrela et al, 2019	437	15	-	-	-	-	-	5	8	5	Wound Dehiscence – 12 Non-union – 3	N= 48 10.98%
Sukegawa et al, 2020	440	12	39	2	6	-	-	4	6	199	Growth facilitation: 3 Unknown – 1 (not presented)	N= 272 61.81%
Sadiq Ali et al, 2021	78	20	-	-	-	14	2	8	-	-	Cancer phobia - 3	N= 47 60.26%
Total	4218	139	46	18	14	27	4	31	14	216	55	564

Table 4. Number and locations of miniplates placed and removed

Author/ Year	No & % of miniplates placed (maxilla& mandible)	No & % of miniplates removed (maxilla& mandible)	No & location of miniplates placed in mandible	No & location of miniplates removed from mandible No (%)	No & Location of miniplates placed (maxilla and zygoma)	Location of miniplates removed from maxilla No (%)
Brown et al, 1989	105	18 (17.14%)	Angle - 29 Mental area - 21 Symphysis - 46 Ramus – 2 Total= 98	Angle- 2 Mental area- 6 Symphysis- 10 Ramus - 0 otal= 18 (17.14%)	Zygomatic Buttress - 5 Piriform fossa- 2 Total=7	Zygomatic Buttress - 0 Piriform fossa- 0 Total= 0
Islamoglu et al, 2002	296	21 (7.09%)	Body - 56 Symphysis - 20 Angle – 22 Total=98	Body- 3 Symphysis- 10 Angle – 0 Total= 13 (4.39%)	Maxillary - 96 Other - 102 Inferior orbital rim Zygomatic region Total=198	Maxilla- 8 Other-0 Total= 8 (2.70%)
Murthy et al, 2005	163	6 (3.68%)	Mand ramus - 6 Mand angle - 15 Mand body - 7 Mand symphysis – 25 Total=53	Mand ramus- 0 Mand angle - 3 Mand body- 0 Mand symphysis – 3 Total=6 (3.68%)	Frontal - 4 Nasal - 8 Frontozyg suture - 30 Zygoma - 4 Infraorbital rim - 23 Piriform area - 10 Zyg maxillary buttress – 31 Total= 110	Frontal - Nasal - Frontozyg suture - Zygoma - Infraorbital rim - Piriform area - Zyg maxillary buttress – Total=0
Rallis et al, 2006	599	37 (6.18%)	Asc ramus - 28 Ext oblique ridge - 22 Angle - 16 Body - 68 Mental area – 169 Total= 303	Asc ramus – Ext oblique ridge - 3 Angle - 1 Body - 9 Mental area – 8 Total=21 (3.50%)	Frontal - 8 Frontozyg suture - 129 Frontonasal suture - 6 Infraorbital rim - 73 Zygomatic arch - 1 Ant. wall of antrum - 39 Zyg buttress – 40 Total= 296	Frontal – Frontozyg suture - 2 Frontonasal - 2 Infraorbital rim - 4 Zygomatic arch- Ant. wall of antrum - 6 Zyg buttress – 2 Total= 16 (2.67%)
Dae-Kyun et al, 2007	609	41 (6.73%)	Mandible = 222	Mandible = 11 (1.8%)	Maxilla = 387	Maxilla = 30 (4.93%)
O'Connell et al, 2009	800	31 (3.88%)	Mandible – 402	Mandible – 26 Total 26 (3.25%)	Maxilla – 92 Orbitozygomatic – 306 Total= 398	Maxilla – 3 Orbitozygomatic – 2 Total= 5 (0.63%)

Pan et al, 2013	384	35 (9.11%)	Body - 92 Symph/parasymph75 Angle - 38 Condyle – 31 Total=236	Body - 15 Symphysis/parasymphysis- 12 Angle - 1 Condyle – 1 Total=29 (7.55%)	Zygomatic buttress - 44 Frontozygomatic - 33 Infraorbital rim - 42 NOE/frontal bone - 14 Piriform aperture – 15 Total=148	Zygomatic buttress - 2 Frontozygomatic- 2 Infraorbital rim – 2 NOE/frontal bone - Piriform aperture- Total=6 (1.56%)
Llandro et al, 2015	307	8 (2.61%)	-	-	Buttress – 192 Zygomatico frontal – 86 Infraorbital – 28 Left zygomatic arch – 1 Total= 307	Buttress – 7 Zygomatico frontal – Infraorbital – 1 Left zygomatic arch – Total= 8 (2.61%)
Gorrela et al, 2019	437	48 (10.98%)	Para symphysis - 126 Angle - 52 Condyle - 25 Body – 42 Total=245	Para symphysis - 12 Angle - 12 Condyle – Body – 9 Total=33 (7.50%)	Maxilla - 140 Zygomatic complex - 52 Total= 192	Maxilla – 6 Zygomatic complex - 9 Total=15 (3.43%)
Sukegawa et al, 2020	440	272 (61.82%)	Condyle - 98 Symphysis - 79 Angle - 62 Parasymphysis - 48 Body – 30 Total=317	Condyle - 59 Symphysis - 59 Angle - 53 Parasymphysis - 37 Body – 14 Total=222 (50.45%)	Zygomatic buttress - 41 Piriform aperture - 34 Infraorbital rim - 30 Frontozygomatic – 18 Total= 123	Zygomatic buttress - 22 Piriform aperture - 20 Infraorbital rim - 3 Frontozygomatic – 5 Total=50 (11.36%)
Sadiq et al, 2021	78	47 (60.26%)	Angle – 21 Symphysis – 15 Parasymphysis – 7 Body – 8 Condyle – 4 Total= 55	Angle – 16 Symphysis – 8 Parasymphysis – 4 Body – 3 Condyle – 1 Total= 32 (41.0%)	Maxilla – 7 Zygoma – 16 Total= 23	Maxilla – 6 Zygoma – 9 Total=15 (19.2%)
Total	4218	564 (13.37%)	2029	411	2189	153