

Study ID	Arms	Number of patients	Age; in years; mean (SD)	Sex; Male, n (%)	Preop tumor volume in cm3; mean (SD)	Type of pituitary adenoma		Subtypes of functioning pituitary adenoma			
						functioning, n (%)	nonfunctioning, n (%)	GH-producing, n (%)	PRL-producing, n (%)	ACTH-producing, n (%)	TSH-producing, n (%)
Prajapati 2018 ¹	ETSA	17	41.06 (11.75)	NR	NR	13 (43.3)	17 (56.67)	7 (23.3)	5 (16.67)	1 (3.33)	NR
	MTSA	13	41.91 (13.23)	NR	NR						NR
Zaidi 2016 ²	ETSA	55	55.9 (13.8)	35 (63.6)	13.4 (14.5)	NR	NR	NR	NR	NR	NR
	MTSA	80	59.1 (14.6)	50 (62.5)	11.0 (12.4)	NR	NR	NR	NR	NR	NR
Trimpou 2022 ³	ETSA	26	48	8 (31)	9.04 (mm)	NR	NR	NR	NR	20 (77)	NR
	MTSA	14	44	2 (14)	6.07 (mm)	NR	NR	NR	NR	5(39)	NR
Phogat 2020 ⁴	ETSA	119	42.3	68 (57.9)	NR	38 (23.5)	NR	NR	NR	NR	NR
	MTSA	79	44.5	49 (60.02)	NR	22 (27.8)	NR	NR	NR	NR	NR
Song 2022 ⁵	ETSA	210	54 (12)	100 (47.6)	2.8 (0.9)	NR	NR	NR	NR	NR	9 (4.29)
	MTSA	304	55 (12)	147 (48.4)	2.7 (0.9)	NR	NR	NR	NR	NR	17 (5.59)
Goshtasbi 2021 ⁶	ETSA	16373	52.8 (15.8)	8510 (52)	23.8 (12.5) (mm)	NR	NR	NR	NR	NR	NR
	MTSA	14115	53.3 (15.8)	7376 (52.3)	25.2 (13.0) (mm)	NR	NR	NR	NR	NR	NR
Pablo 2019 ⁷	ETSA	140	48.5 (18–85) ‡	61 (44)	NR	NR	59 (42.14)	41 (29.28)	6 (4.29)	33 (23.6)	0
	MTSA	259	51 (17–90) ‡	109 (42)	NR	NR	99 (38.22)	73 (28.18)	18 (6.94)	66 (25.5)	0
Eseonu 2017 ⁸	ETSA	275	49.0 (16.2)	115 (41.8)	6.11 (6.7)	100 (36.4)	175 (63.6)	48 (17.45)	8 (2.9)	42 (15.72)	NR
	MTSA	109	48.8 (15.8)	48 (44.0)	5.75 (6.6)	35 (32.11)	74 (67.9)	15 (13.76)	2 (1.83)	14 (12.8)	NR
Findlay 2023 ⁹	ETSA	300	52.8 (16.3)	123 (41)	NR	226 (75.33)	74 (24.67)	58 (19.33)	22 (7.3)	53 (17.67)	NR
	MTSA	300	52.6 (16.3)	133 (44.3)	NR	227 (75.67)	73 (24.33)	60 (20)	39 (13)	42 (14)	NR
Agam 2018 ¹⁰	ETSA	170	53.3 (13.6)	528 (45.8)	NR	NR	623 (54.03)	168 (14.6)	163 (14.14)	141 (12.22)	NR
	MTSA	983	49.1 (16.6)		NR	NR					NR
Akbari 2018 ¹¹	ETSA	16	39.43 (15.21)	9 (56)	36.3 (4.4) (mm)	NR	NR	NR	NR	NR	NR
	MTSA	19	43.06 (11.29)	10 (53)	34.0 (4.6) (mm)	NR	NR	NR	NR	NR	NR
Casler 2005 ¹²	ETSA	15	41.6	6 (40)	NR	NR	NR	NR	NR	NR	NR
	MTSA	15	50.66	10 (66.67)	NR	NR	NR	NR	NR	NR	NR
Cheng 2011 ¹³	ETSA	68	37.2 (13 – 69) ‡	31 (45.6)	NR	NR	NR	16 (23.5)	25 (36.77)	22 (32.35)	5 (7.3)
	MTSA	59	33.8 (11 – 71) ‡	20 (33.9)	NR	NR	NR	13 (22.03)	25 (42.4)	18 (30.5)	3 (5.08)
Gao 2016 ¹⁴	ETSA	60	44.6 (19–75) ‡	26 (43.33)	NR	NR	27 (45)	7 (11.67)	21 (35)	5 (8.33)	NR
	MTSA	45	48.8 (21–77) ‡	19 (42.22)	NR	NR	22 (48.89)	4 (8.89)	16 (35.56)	3 (6.67)	NR
Higgins 2012 ¹⁵	ETSA	19	54.2	11 (58)	2.34	3 (15.79)	NR	NR	NR	NR	NR
	MTSA	29	52.8	14 (48)	2.02	11 (37.9)	NR	NR	NR	NR	NR
Hong 2015 ¹⁶	ETSA	35	50.8 (13.8)	16 (45.7)	17.3 (5.8) mm	NR	NR	NR	NR	NR	NR
	MTSA	20	58.5 (12.9)	9 (45)	22.7 (4.7) mm	NR	NR	NR	NR	NR	NR
Huang 2023 ¹⁷	ETSA	73	NR	30 (41.1)	NR	NR	15 (20.55)	8 (10.96)	7 (9.6)	12 (16.44)	NR

	MTSA	54	NR	20 (37.04)	NR	NR	11 (20.37)	5 (9.3)	8 (14.8)	7 (12.96)	NR
Little 2019 ¹⁸	ETSA	177	58.1 (14.0)	104 (58.8)	7.1 (5.7)	NR	NR	NR	9 (5.08)	NR	NR
	MTSA	82	58.6 (13.3)	52 (63.4)	7.4 (7.8)	NR	NR	NR	9 (10.98)	NR	NR
Qiao 2021 ¹⁹	ETSA	424	44.1 (12.6)	196 (46.1)	0.9 [0.4, 3.5] ‡	NR	NR	NR	NR	NR	NR
	MTSA	694	44.2 (11.8)	318 (47.3)	0.9 [0.5, 4.0] ‡	NR	NR	NR	NR	NR	NR
Razak 2012 ²⁰	ETSA	40	47.4	19 (47.5)	NR	16 (40)	24 (60)	8 (20)	2 (5)	5 (12.5)	1 (2.5)
	MTSA	40	49.3	22 (55)	NR	14 (35)	26 (65)	11 (27.5)	2 (5)	1 (2.5)	0
Shimony 2021 ²¹	ETSA	39	57.79 (12.91)	27 (69.2)	12.1 (10.3)	NR	NR	NR	NR	NR	NR
	MTSA	48	52.75 (13.93)	30 (62.5)	9.2 (7.6)	NR	NR	NR	NR	NR	NR
Gompel 2021 ²²	ETSA	261	51.7 (0.9)	NR	2.1 (0.1)	NR	116 (44.44)	38 (14.56)	17 (6.5)	58 (22.22)	4 (1.53)
	MTSA	273	50.3 (0.9)	NR	2.1 (0.1)	NR	137 (50.18)	45 (16.48)	11 (4.03)	54 (19.78)	3 (1.1)
Karppinen 2015 ²³	ETSA	41	58.5 (16)	23 (56)	6.4 (4.2)	NR	NR	NR	NR	NR	NR
	MTSA	144	58.4 (13)	95 (66)	8.7 (8.2)	NR	NR	NR	NR	NR	NR
Messerer 2011 ²⁴	ETSA	82	57 (20–82) ‡	47 (57.32)	13190 mm3	NR	NR	NR	NR	NR	NR
	MTSA	82	56.5 (27–84) ‡	51 (62.2)	14506 mm3	NR	NR	NR	NR	NR	NR
Dallapiazza 2014 ²⁵	ETSA	56	56.2 (12.8)	27 (48.2)	NR	NR	NR	NR	NR	NR	NR
	MTSA	43	56.7 (16.9)	24 (55.81)	NR	NR	NR	NR	NR	NR	NR
Choe 2008 ²⁶	ETSA	12	47 (12)	5 (41.67)	NR	NR	NR	9 (75)	NR	3 (25)	NR
	MTSA	11	48 (10)	2 (18.18)	NR	NR	NR	8 (72.7)	NR	3 (27.3)	NR
D'Haens 2009 ²⁷	ETSA	60	37 (10-70) ‡	19 (32)	NR	NR	NR	13 (21.67)	29 (48.33)	16 (26.67)	2 (3.33)
	MTSA	60	35 (10-68) ‡	16 (27)	NR	NR	NR	11 (18.33)	36 (60)	13 (21.67)	0
O'Malley 2008 ²⁸	ETSA	25	47.9 (18–73) ‡	15 (60)	NR	NR	NR	1 (4)	3 (12)	2 (8)	1 (4)
	MTSA	25	50.8 (23–78) ‡	16 (64)	NR	NR	NR	1 (4)	0	1 (4)	0
Jain,2007 ²⁹	ETSA	10	40.1	NR	NR	NR	NR	NR	NR	NR	NR
	MTSA	10	31.6	NR	NR	NR	NR	NR	NR	NR	NR
Kahilogullari 2013 ³⁰	ETSA	25	40.84 (12.56)	4 (16)	NR	NR	NR	NR	NR	NR	NR
	MTSA	25	46.56 (7.75)	6 (24)	NR	NR	NR	NR	NR	NR	NR
Halvorsen 2013 ³¹	ETSA	238	NR	291 (57.5)	NR	NR	352 (69.6)	79 (15.6)	20 (4.0)	51 (10.1)	4 (0.8)
	MTSA	268	NR		NR	NR					

Supplementary table 1; baseline characteristics of the included population.

‡; median and IQR

ETSA; Endoscopic transsphenoidal approach, MTSA; Microscopic transsphenoidal approach.

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