

Table S1 Study search strategy

No.	Query	Results
1.1 PubMed (Available via https://pubmed.ncbi.nlm.nih.gov/)		
#1	Search: ((((((((((Pituitary Neoplasm[Title/Abstract]) OR (Pituitary Neoplasms[Title/Abstract])) OR (Pituitary Tumor[Title/Abstract])) OR (Pituitary Tumors[Title/Abstract])) OR (Pituitary Adenoma[Title/Abstract])) OR (Pituitary Adenomas[Title/Abstract])) OR (Pituitary Carcinoma[Title/Abstract])) OR (Pituitary Carcinomas[Title/Abstract])) OR (Cancer of the Pituitary[Title/Abstract])) OR (Cancer of Pituitary[Title/Abstract])) OR (Pituitary Cancer[Title/Abstract])) OR (Pituitary Cancers[Title/Abstract]) Filters: Abstract	21,220
#2	Search: ((((((((((((((Frameless Stereotaxy[Title/Abstract]) OR (Stereotaxy, Frameless[Title/Abstract])) OR (Image-guidance[Title/Abstract])) OR (Intraoperative Magnetic[Title/Abstract])) OR (Resonance Imaging[Title/Abstract])) OR (Intraoperative MRI[Title/Abstract])) OR (Stereotaxy Neuronavigation[Title/Abstract])) OR (MR Imaging Neuronavigation[Title/Abstract])) OR (iMRI[Title/Abstract])) OR (SNN[Title/Abstract])) OR (INN[Title/Abstract])) OR (Stereotaxy-guided Operative Neurosurgery[Title/Abstract])) OR (Frame Stereotactic Neurosurgery[Title/Abstract])) OR (Frameless Stereotactic Neurosurgery[Title/Abstract])) OR (MR Image-guided[Title/Abstract])) OR (Neuro-navigation[Title/Abstract])) OR (CT-guided[Title/Abstract])) OR (MRI-guided[Title/Abstract]) Filters: Abstract	333,384
#3	#1 AND #2	2,051
1.2 Cochrane library (Available via https://www.cochrane.org/)		
#1	(Pituitary Neoplasm):ti,ab,kw OR (Pituitary Neoplasms):ti,ab,kw OR (Pituitary Tumor):ti,ab,kw OR (Pituitary Tumors):ti,ab,kw OR (Pituitary Adenoma):ti,ab,kw	808
#2	(Pituitary Adenomas):ti,ab,kw OR (Pituitary Carcinoma):ti,ab,kw OR (Pituitary Carcinomas):ti,ab,kw OR (Cancer of the Pituitary):ti,ab,kw OR (Cancer of Pituitary):ti,ab,kw	567
#3	(Pituitary Cancer):ti,ab,kw OR (Pituitary Cancers):ti,ab,kw	230
#4	#1 OR #2 OR #3	881
#5	(Frameless Stereotaxy):ti,ab,kw OR (Stereotaxy, Frameless):ti,ab,kw OR (Image-guidance):ti,ab,kw OR (Intraoperative Magnetic):ti,ab,kw OR (Resonance Imaging):ti,ab,kw	35,662
#6	(Intraoperative MRI):ti,ab,kw OR (Stereotaxy Neuronavigation):ti,ab,kw OR (MR Imaging Neuronavigation):ti,ab,kw OR (iMRI):ti,ab,kw OR (SNN):ti,ab,kw	615
#7	(INN):ti,ab,kw OR (Stereotaxy-guided Operative Neurosurgery):ti,ab,kw OR (Frame Stereotactic Neurosurgery):ti,ab,kw OR (Frameless Stereotactic Neurosurgery):ti,ab,kw OR (MR Image-guided):ti,ab,kw	23,891
#8	(Neuro-navigation):ti,ab,kw OR (CT-guided):ti,ab,kw OR (MRI-guided):ti,ab,kw	1,015
#9	#5 OR #6 OR #7 OR #8	59,875
#10	#4 AND #9	119
1.3 Embase (Available via https://www.embase.com/)		
#1	(((((((((((Pituitary Neoplasm) OR (Pituitary Neoplasms)) OR (Pituitary Tumor) OR (Pituitary Tumors)) OR (Pituitary Adenoma) OR (Pituitary Adenomas)) OR (Pituitary Carcinoma) OR (Pituitary Carcinomas)) OR (Cancer of the Pituitary) OR (Cancer of Pituitary)) OR (Pituitary Cancer) OR (Pituitary Cancers)	1,489
#2	(((((((((((((((Frameless Stereotaxy) OR (Stereotaxy, Frameless)) OR (Image-guidance) OR (Intraoperative Magnetic) OR (Resonance Imaging) OR (Intraoperative MRI) OR (Stereotaxy Neuronavigation) OR (MR Imaging Neuronavigation) OR (iMRI) OR (SNN) OR (INN) OR (Stereotaxy-guided Operative Neurosurgery) OR (Frame Stereotactic Neurosurgery) OR (Frameless Stereotactic Neurosurgery) OR (MR Image-guided) OR (Neuro-navigation) OR (CT-guided) OR (MRI-guided)	27,789
#3	#1 AND #2	3
1.4 Web of Science (Available via https://www.webofscience.com/)		
#1	(((((((((((AB=(Pituitary Neoplasm) OR AB=(Pituitary Neoplasms)) OR AB=(Pituitary Tumor) OR AB=(Pituitary Tumors)) OR AB=(Pituitary Adenoma) OR AB=(Pituitary Adenomas)) OR AB=(Pituitary Carcinoma) OR AB=(Pituitary Carcinomas)) OR AB=(Cancer of the Pituitary) OR AB=(Cancer of Pituitary)) OR AB=(Pituitary Cancer) OR AB=(Pituitary Cancers) and Preprint Citation Index (Exclude – Database)	41,164
#2	(((((((((((((((AB=(Frameless Stereotaxy) OR AB=(Stereotaxy, Frameless) OR AB=(Image-guidance) OR AB=(Intraoperative Magnetic) OR AB=(Resonance Imaging) OR AB=(Intraoperative MRI) OR AB=(Stereotaxy Neuronavigation) OR AB=(MR Imaging Neuronavigation) OR AB=(iMRI) OR AB=(SNN) OR AB=(INN) OR AB=(Stereotaxy-guided Operative Neurosurgery) OR AB=(Frame Stereotactic Neurosurgery) OR AB=(Frameless Stereotactic Neurosurgery) OR AB=(MR Image-guided) OR AB=(Neuro-navigation) OR AB=(CT-guided) OR AB=(MRI-guided) and Preprint Citation Index (Exclude – Database)	554,761
#3	((AB=(Gross Total Resection) OR AB=(GTR) OR AB=(Extent of Resection) and Preprint Citation Index (Exclude – Database)	42,843
#4	#1 AND #2 AND #3	217
1.5 Scopus (Available via https://www.scopus.com/)		
#1	pituitary AND neoplasm OR pituitary AND neoplasms OR pituitary AND tumor OR pituitary AND tumors OR pituitary AND adenoma OR pituitary AND adenomas OR pituitary AND carcinoma OR pituitary AND carcinomas OR cancer AND of AND the AND pituitary OR cancer AND of AND pituitary OR pituitary AND cancer OR pituitary AND cancers	174,349
#2	frameless AND stereotaxy OR stereotaxy, AND frameless OR image-guidance OR intraoperative AND magnetic OR resonance AND imaging OR intraoperative AND mri OR stereotaxy AND neuronavigation OR mr AND imaging AND neuronavigation OR imri OR snn OR inn OR stereotaxy-guided AND operative AND neurosurgery OR frame AND stereotactic AND neurosurgery OR frameless AND stereotactic AND neurosurgery OR mr AND image-guided OR neuro-navigation OR ct-guided OR mri-guided	446
#3	#1 AND #2	52

Table S2 Risk of bias analysis in the light of the NOS for the GTR-relevant literatures included in the meta-analysis.

Author	Year	Is the case definition adequate?	Representativeness of the cases	Selection of Controls	Definition of controls	Comparability of cases and controls on the bases of the design or analysis	Ascertainment of exposure	Same method of ascertainment for cases and controls	Nonresponse rate	Total score
Low-field										
Ahn <i>et al.</i> (31)	2008	★	★	★	☆	★★	★	★	★	8
Berkmann <i>et al.</i> (6)	2011	★	★	★	☆	★★	★	★	★	8
Berkmann <i>et al.</i> (32)	2014	★	★	★	☆	★★	★	★	★	8
Bohinski <i>et al.</i> (8)	2001	★	★	★	☆	★★	★	★	★	8
Fahlbusch <i>et al.</i> (33)	2001	★	★	★	☆	★★	★	★	★	8
García <i>et al.</i> (34)	2017	★	★	★	☆	★★	★	★	★	8
Hlavica <i>et al.</i> (13)	2013	★	★	★	☆	★★	★	★	★	8
Jiménez <i>et al.</i> (35)	2016	★	★	★	☆	★★	★	★	★	8
Martin <i>et al.</i> (36)	1999	★	★	★	☆	★★	★	★	★	8
Ramm-Petersen <i>et al.</i> (37)	2011	★	★	★	☆	★★	★	★	★	8
Schwartz <i>et al.</i> (38)	2006	★	★	★	☆	★★	★	★	★	8
Strange <i>et al.</i> (39)	2020	★	★	★	☆	★★	★	★	★	8
Wu <i>et al.</i> (40)	2009	★	★	★	☆	★★	★	★	★	8
High-field										
Berkmann <i>et al.</i> (41)	2012	★	★	★	☆	★★	★	★	★	8
Chen <i>et al.</i> (23)	2012	★	★	★	☆	★☆	★	★	★	7
Dort <i>et al.</i> (42)	2001	★	★	★	☆	★★	★	★	★	8
Gohla <i>et al.</i> (43)	2020	★	★	★	☆	★★	★	★	★	8
Hlaváč <i>et al.</i> (44)	2019	★	★	★	☆	★★	★	★	★	8
Kuge <i>et al.</i> (45)	2013	★	★	★	☆	★★	★	★	★	8
Li <i>et al.</i> (46)	2015	★	★	★	☆	★★	★	★	★	8
Nimsky <i>et al.</i> (25)	2004	★	★	★	☆	☆☆	★	★	★	6
Nimsky <i>et al.</i> (12)	2006	★	★	★	☆	☆☆	★	★	★	6
Pal'a <i>et al.</i> (9)	2017	★	★	★	☆	★★	★	★	★	8
Pala <i>et al.</i> (47)	2022	★	★	★	☆	★★	★	★	★	8
Pala <i>et al.</i> (48)	2022	★	★	★	☆	★★	★	★	★	8
Paterno <i>et al.</i> (29)	2014	★	★	★	☆	☆☆	★	★	★	6
Sylvester <i>et al.</i> (30)	2015	★	★	★	☆	☆☆	★	★	★	6
Szerlip <i>et al.</i> (49)	2011	★	★	★	☆	★★	★	★	★	8
Tanei <i>et al.</i> (52)	2013	★	★	★	☆	★★	★	★	★	8
Zhang <i>et al.</i> (53)	2017	★	★	★	☆	★★	★	★	★	8
Zhang <i>et al.</i> (54)	2019	★	★	★	☆	★★	★	★	★	8
Ultra-high-field										
Fomekong <i>et al.</i> (50)	2014	★	★	★	☆	★★	★	★	★	8
Netuka <i>et al.</i> (26)	2011	★	★	★	☆	☆☆	★	★	★	6
Qiu <i>et al.</i> (27)	2012	★	★	★	☆	☆☆	★	★	★	6
Serra <i>et al.</i> (11)	2016	★	★	★	☆	★★	★	★	★	8
Staatjes <i>et al.</i> (10)	2019	★	★	★	☆	★★	★	★	★	8
Zaidi <i>et al.</i> (14)	2016	★	★	★	☆	★★	★	★	★	8

NOS, Newcastle-Ottawa scale; GTR, gross total resection.

Table S3 Risk of bias analysis in the light of the NOS for the CSF leak-relevant publications included in the meta-analysis.

Author	Year	Is the case definition adequate?	Representativeness of the cases	Selection of Controls	Comparability of cases and controls on the bases of the design or analysis	Ascertainment of exposure	Same method of ascertainment for cases and controls	Nonresponse rate	Total score
Achey <i>et al.</i> (65)	2019	★	★	★	★★	★	★	★	8
Alshareef <i>et al.</i> (55)	2021	★	★	★	★★	★	★	★	8
Chung <i>et al.</i> (24)	2015	★	★	★	★☆	★	★	★	7
Eboli <i>et al.</i> (28)	2011	★	★	★	☆☆	★	★	★	6
Tosaka <i>et al.</i> (61)	2015	★	★	★	★★	★	★	★	8

NOS, Newcastle-Ottawa scale; CSF leak, cerebrospinal fluid leak.