

## Appendix 1 Search strategy

Our search syntax for UWEES studies for Embase on OVID was:

Embase <1974 to 2023 February 02>

- 1 fistula/ or exp perilymph fistula/ 35366
- 2 semicircular canal/ or exp vestibular labyrinth/ 20956
- 3 inner ear/ or \*vestibular labyrinth/ 13798
- 4 ((labyrinth\* adj2 ear) or (labyrinth\* adj2 canal) or lateral semicircular canal\* or lateral semicircular canal fistula\* or labyrinthine fistula\* or semicircular canal\* or semicircular duct\* or semicircular canal fistula\* or lateral semicircular canal dehiscence\* or semicircular canal dehiscence\* or canal dehiscence syndrome\* or LF or LSCF or LSCD or SCD).tw.62265
- 5 1 or 2 or 3 or 4 123240
- 6 cholesteatoma/ or exp "benign head and neck tumor"/ or exp ear tumor/ 34036
- 7 cholesteatoma\*.tw. 7460
- 8 6 or 7 35153
- 9 5 and 8 1173
- 10 water/ 333967
- 11 isotonic solution/ 3938
- 12 Hartmann solution/ 717
- 13 sodium chloride/ 217812
- 14 Ringer lactate solution/ 8777
- 15 irrigation solution/ 729
- 16 (underwater or under water or perfusion).tw. 252819
- 17 endoscopic surgery/ or exp natural orifice transluminal endoscopic surgery/ 59314
- 18 endoscopy/ or exp videoendoscopy/ 135702
- 19 procedures/ 568325
- 20 ((ear or otologic\* or ent or otolaryngol\* or audito\* or auric\* or keyhole\* or key hole\* or transcanal\* or endoscop\*) adj3 (surg\* or operat\* or procedure\* or technique\* or method\*)).tw. 108134
- 21 (TEES or UWEES or hydrodissect\*).tw. 2101
- 22 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 1584648
- 23 clinical outcome/ or exp treatment outcome/ 2139093
- 24 "severity of illness index"/ 20053
- 25 follow up/ 1966554
- 26 adverse event/ or adverse outcome/ 135451
- 27 postoperative complication/ 388148
- 28 (hearing or hearing outcome\* or hearing loss\* or sensorineural hearing or audiometry or audiolog\* or bone conduction\* or bone line\* or vertig\* or disease\* or disease clearance\* or recurrence\* or recurrence rate\* or recover\* or vestibular or vestibular function\* or facial nerve\* or facial paralys\* or facial nerve function\*).tw. 7640313
- 29 23 or 24 or 25 or 26 or 27 or 28 10246559
- 30 9 and 22 and 29 195

Our initial search syntax for microscopic studies for Medline on OVID was:

Ovid MEDLINE(R) ALL <1946 to February 02, 2023>

- 1 Fistula/ 19055
- 2 ear, inner/ or labyrinthine fluids/ or semicircular canals/ or semicircular ducts/ or vestibule, labyrinth/ 29926
- 3 ((labyrinth\* adj2 ear) or (labyrinth\* adj2 canal) or lateral semicircular canal\* or lateral semicircular canal fistula\* or labyrinthine fistula\* or semicircular canal\* or semicircular duct\* or semicircular canal fistula\* or lateral semicircular canal dehiscence\* or semicircular canal dehiscence\* or canal dehiscence syndrome\* or LF or LSCF or LSCD or

SCD).tw.39434  
4 1 or 2 or 3 83694  
5 cholesteatoma/ or cholesteatoma, middle ear/ 6603  
6 cholesteatoma\*.mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] 8477  
7 5 or 6 8477  
8 4 and 7 563  
9 Microsurgery/ 28535  
10 Microscopy/ 46389  
11 otologic surgical procedures/ or mastoidectomy/ or myringoplasty/ or tympanoplasty/ 8680  
12 ((ear or otologic\* or ent or otolaryngol\* or audito\* or auric\* or reconstruct\* or micro\* or microscopic\* or ear canal\* or canal wall\* or canal wall down or canal wall up or mastoid\* or middle ear) adj3 (surg\* or operat\* or procedure\* or technique\* or method\*)).tw. 241553  
13 (MES or CWU or CWD or tympanomastoidectom\* or tympanoplast\* or myringoplast\* or mastoidectom\* or surgical microscop\*).tw. 17904  
14 9 or 10 or 11 or 12 or 13 321871  
15 treatment outcome/ or exp disease-free survival/ or exp progression-free survival/ or exp therapeutic index/ or exp treatment failure/ 1223005  
16 patient outcome assessment/ or exp patient reported outcome measures/ 18743  
17 Postoperative Complications/ 397163  
18 Recurrence/ 197208  
19 (hearing or hearing outcome\* or hearing loss\* or sensorineural hearing or audiometry or audiolog\* or bone conduction\* or bone line\* or vertig\* or disease\* or disease clearance\* or recurrence\* or recurrence rate\* or recover\* or vestibular or vestibular function\* or facial nerve\* or facial paralys\* or facial nerve function\*).tw. 5581364  
20 15 or 16 or 17 or 18 or 19 6754700  
21 8 and 14 and 20 208

**Table S1** Risk of bias judgements for UWEES studies using the NIH quality assessment tool

Criteria	Mulazimoglu, 2022 (23)	Schmerber, 2021 (20)	Thangavelu, 2021 (21)	Yamauchi, 2021 (22)
Study question or objective clearly stated	1	1	1	1
Study population clearly and fully described	1	1	1	1
Cases are consecutive	NR	1	1	1
Subjects are comparable	1	1	1	1
Intervention clearly described	1	1	1	1
Outcome measures clearly defined, valid, reliable and implemented consistently across all study participants	1	1	1	1
Length of follow up adequate	0	1	1	0
Statistical methods well described	0	0	1	1
Results well described	1	0	1	1
Total	6	7	9	8
Grade	Fair	Good	Good	Good

Table S2 Risk of bias judgements for microscopic studies using the NIH quality assessment tool

Criteria	Abramson, 1974 (59)	Baghel, 2021 (24)	Balci, 2019 (25)	Bartochovska, 2021 (26)	Basu, 2019 (54)	Baylan, 2018 (27)	Bo, 2016 (56)	Busaba, 1999 (28)	Carlson, 2014 (29)	Chen, 2010 (30)	Faramarzi, 2011 (31)	Geerse, 2017 (32)	Ghiasi, 2011 (55)	Glasscock, 1990 (50)	Gormley, 1986 (53)	Hirvonen, 2016 (57)	Jang, 2013 (33)	Katsura, 2014 (34)	Kitahara, 2014 (35)	Kobayashi, 1995 (36)	Liu, 1993 (37)	Meyer, 2016 (38)	Moon, 2012 (39)	Ostri, 1989 (40)	Palva, 1971 (58)	Parisier, 1991 (5)	Pulec, 1996 (51)	Quaranta, 2009 (41)	Rah, 2018 (42)	Rosito, 2019 (43)	Sari, 2010 (44)	Sheehy, 1979 (4)	Soda-Merhy, 2000 (2)	Stephenson, 2011 (61)	Sun, 2022 (46)	Tos 1,975 (52)	Ueda, 2009 (47)	Vartiainen, 1992 (48)	Yamamoto, 2010 (49)					
Study question or objective clearly stated	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Study population clearly and fully described	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1
Cases are consecutive	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	NR	1	1	1	1		
Subjects are comparable	0	1	1	1	NR	1	1	1	1	1	1	1	1	0	1	NR	1	1	1	1	1	1	1	NR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	NR	1	1	1	1	
Interventionclearly described	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	0	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	
Outcome measures clearly defined, valid, reliable and implemented consistently across all study participants	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	
Length of follow up adequate	NR	0	1	1	0	0	0	0	1	0	0	1	NR	0	NR	NR	NR	1	0	1	NR	1	1	1	1	1	NR	0	1	NR	1	NR	NR	NR	1	1	1	1	1	1	1	NR		
Statistical methods well described	0	0	0	1	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	0	0	1	1	0	0	0	0	0		
Results well described	0	1	1	1	0	1	0	1	0	1	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	0	0	1	1	1	1		
Total	2	7	8	9	5	8	5	8	7	7	7	9	6	4	6	4	8	7	8	7	7	9	9	8	3	8	4	8	8	7	9	3	7	9	8	4	8	8	8	7	7			
Grade	Poor	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Good	Good	Fair	Fair	Fair	Fair	Good	Good	Good	Good	Good	Good	Good	Poor	Good	Fair	Good	Good	Good	Good	Poor	Good	Good	Good	Good	Fair	Good	Good	Good	Good				

**Table S3** Summary data for UWEES studies

Variables	Mulazimoglu	Schmerber	Thangavelu	Yamauchi
Year	2022 (23)	2021 (20)	2021 (21)	2021 (22)
Sample size	3.0	16.0	20.0	12.0
Lateral semicircular canal fistula	3.0	16.0	15.0	–
Mean ages in years	38.7	47.0	45.0	57.0
Female	2.0	–	7.0	4.0
Left side	1.0	4.0	9.0	6.0
Primary surgery	1.0	5.0	14.0	–
Dornhoffer type I	1.0	–	5.0	6.0
Dornhoffer type IIa	2.0	–	–	1.0
Dornhoffer type IIb	1.0	–	–	0.0
Dornhoffer type III	0.0	–	10.0	4.0
Positive fistula sign	–	5.0	–	–
CWU	1.0	–	0.0	2.0
CWD	2.0	–	20.0	10.0
Fistula sealed	3.0	14.0	20.0	12.0
Matrix left intact	0.0	0.0	0.0	0.0
Intercurrent ossicular erosion	–	14.0	–	–
Fallopian canal erosion	1.0	–	–	–
Topical steroids	3.0	–	20.0	–
IV steroids	3.0	–	20.0	–
Mean follow up duration	10.0	72.0	45.3	6.0
Mean difference in BC threshold	2.5	1.8	2.5	0.0
Mean pre operative BC threshold	12.5	20.7	20.0	36.8
Mean post operative BC threshold	15.0	22.5	17.5	36.8
Pre operative deafness	0.0	2.0	1.0	0.0
BC threshold improved	–	0.0	4.0	1.0
BC threshold unchanged	–	13.0	13.0	11.0
BC threshold worsened	–	1.0	2.0	0.0
Post operative deafness due to surgery	0.0	0.0	0.0	0.0
Preoperative vertigo	1.0	–	7.0	0.0
Postoperative vertigo	0.0	–	2.0	0.0
Pre operative facial weakness	0.0	1.0	0.0	–
Post operative facial weakness	0.0	1.0	0.0	–
Residual/recurrent disease	0.0	0.0	4.0	–

UWEES, under water endoscopic ear surgery; CWD, canal wall down; CWU, canal wall up; IV, intravenous; BC, bone conduction.

**Table S4** Summary data for microscopic studies part A

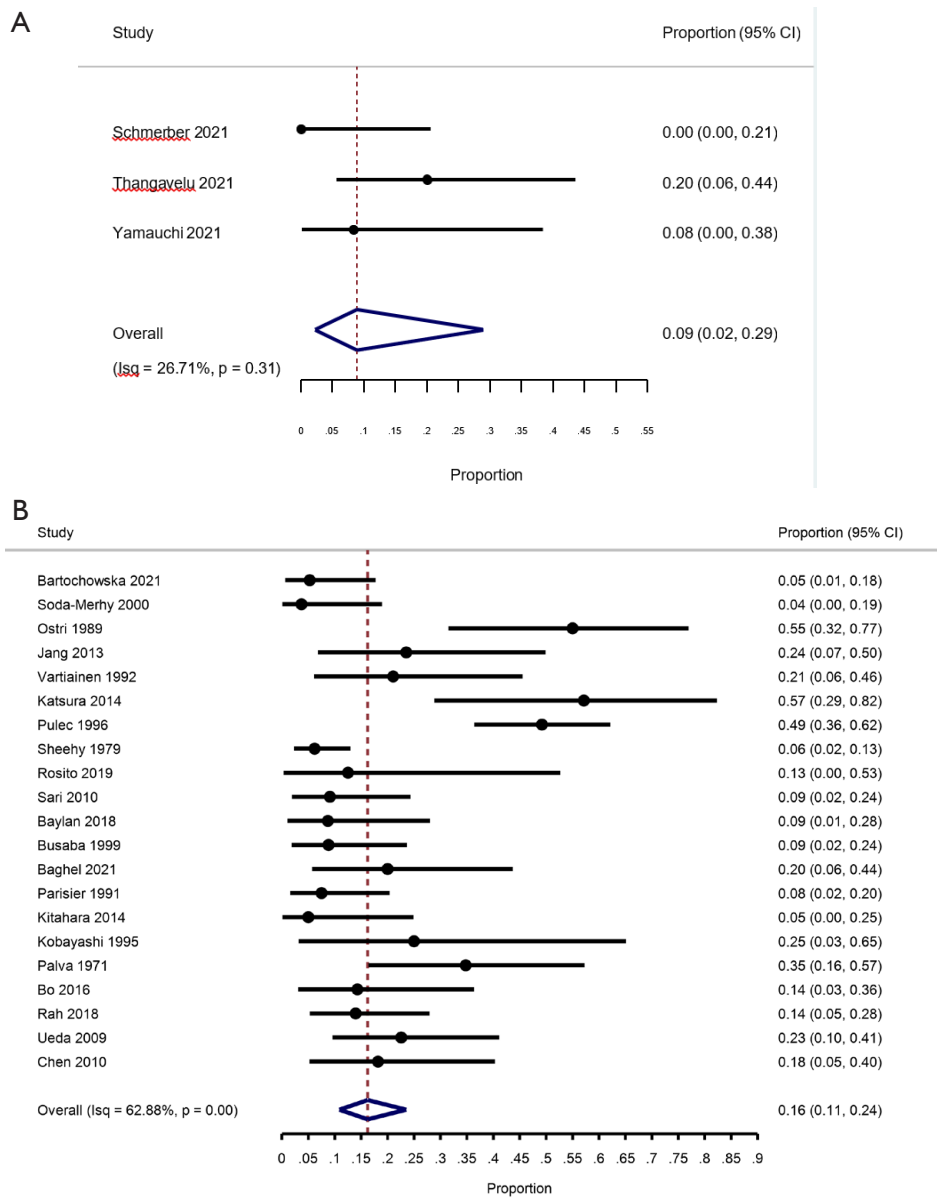
Variables	Bartochowska	Faramarzi	Meyer	Soda-Merhy	Ostri	Jang	Vartiainen	Sun	Katsura	Glasscock	Moon	Pulec	Sheehy	Rosito	Abramson	Stephenson	Balci	Carlson	Sari	Tos
Year	2021 (26)	2011 (31)	2016 (38)	2000 (2)	1989 (40)	2013 (33)	1992 (48)	2022 (46)	2014 (34)	1990 (50)	2012 (39)	1996 (51)	1979 (4)	2019 (43)	1974 (59)	2011 (61)	2019 (25)	2014 (29)	2010 (44)	1975 (52)
Sample size	38.0	24.0	42.0	27.0	20.0	17.0	19.0	36.0	14.0	5.0	38.0	63.0	97.0	8.0	13.0	28.0	32.0	28.0	33.0	14.0
Lateral semicircular canal fistula	33.0	23.0	-	26.0	15.0	-	18.0	35.0	14.0	-	35.0	49.0	93.0	8.0	12.0	25.0	-	4.0	32.0	14.0
Mean ages in years	47.0	-	40.8	37.3	56.0	-	42.3	44.4	58.0	-	51.6	-	56.0	44.4	48.0	38.0	37.1	45.0	37.2	-
Female	20.0	240.0	13.0	16.0	15.0	9.0	9.0	16.0	8.0	-	11.0	-	-	4.0	-	12.0	10.0	8.0	16.0	-
Left side	-	-	-	-	-	-	-	-	-	-	18.0	-	-	-	-	16.0	-	14.0	-	-
Primary surgery	20.0	-	35.0	16.0	17.0	16.0	-	-	-	-	-	-	97.0	9.0	9.0	28.0	31.0	26.0	33.0	12.0
Dornhoffer type I	4.0	-	16.0	18.0	-	-	-	17.0	10.0	-	-	-	-	0.0	-	-	5.0	-	-	-
Dornhoffer type IIa	19.0	-	-	-	-	-	-	-	4.0	-	-	-	-	-	-	-	12.0	-	-	-
Dornhoffer type IIb	9.0	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	15.0	-	-	-
Dornhoffer type III	6.0	-	4.0	1.0	-	-	-	4.0	0.0	-	-	-	-	1.0	-	-	0.0	-	-	-
Positive fistula sign	-	12.0	5.0	-	10.0	-	10.0	11.0	-	-	-	-	65.0	-	11.0	-	15.0	-	14.0	-
CWU	19.0	-	8.0	2.0	-	0.0	1.0	-	5.0	0.0	21.0	0.0	58.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0
CWD	19.0	-	34.0	25.0	-	17.0	16.0	-	9.0	4.0	17.0	63.0	39.0	8.0	13.0	7.0	32.0	4.0	33.0	14.0
Fistula sealed	38.0	24.0	42.0	26.0	20.0	17.0	11.0	36.0	11.0	0.0	38.0	63.0	-	8.0	4.0	28.0	32.0	-	31.0	14.0
Matrix left intact	0.0	0.0	0.0	1.0	0.0	0.0	6.0	0.0	3.0	4.0	0.0	0.0	-	1.0	9.0	0.0	0.0	-	2.0	0.0
Intercurrent ossicular erosion	-	-	-	-	9.0	-	10.0	31.0	-	-	-	-	-	-	-	-	-	22.0	-	5.0
Fallopian canal erosion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	3.0	-
Topical steroids	20.0	-	0.0	-	-	0.0	-	36.0	-	0.0	-	-	-	-	-	-	32.0	-	0.0	-
IV steroids	38.0	-	0.0	-	-	17.0	-	0.0	-	4.0	-	-	-	-	-	-	32.0	-	33.0	-
Mean follow up duration	23.0	3.0	12.0	-	33.0	-	91.0	27.6	60.0	-	26.1	-	-	-	-	20.0	-	48.0	50.0	-
Mean difference in BC threshold	-	0.9	9.4	-	-	-7.8	-5.8	-3.8	0.8	-	-	-	-	-	-	-7.2	1.0	0.1	-	-10.4
Mean pre operative BC threshold	29.0	17.3	21.6	-	-	35.4	46.4	31.2	25.5	-	-	-	-	-	-	23.2	20.8	-	-	48.1
Mean post operative BC threshold	-	18.2	31.0	-	-	27.6	40.6	27.4	26.3	-	-	-	-	-	-	16.0	21.8	-	-	37.7
Pre operative deafness	3.0	5.0	1.0	4.0	3.0	0.0	2.0	0.0	0.0	-	10.0	0.0	12.0	0.0	0.0	-	0.0	0.0	1.0	3.0
BC threshold improved	2.0	-	-	1.0	11.0	4.0	4.0	-	8.0	0.0	-	31.0	6.0	1.0	0.0	-	0.0	-	3.0	-
BC threshold unchanged	32.0	-	31.0	19.0	4.0	13.0	12.0	34.0	16.0	11.0	26.0	32.0	68.0	5.0	12.0	-	27.0	-	20.0	-
BC threshold worsened	4.0	-	6.0	7.0	2.0	0.0	1.0	2.0	-	1.0	2.0	0.0	11.0	-	0.0	-	5.0	-	8.0	-
Post operative deafness due to surgery	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	-	2.0	2.0	-	0.0	0.0	2.0	1.0
Preoperative vertigo	18.0	10.0	19.0	21.0	13.0	-	11.0	18.0	-	1.0	16.0	-	12.0	7.0	-	-	20.0	11.0	18.0	-
Postoperative vertigo	10.0	-	5.0	1.0	0.0	-	2.0	0.0	-	-	4.0	-	4.0	-	-	-	0.0	-	4.0	0.0
Pre operative facial weakness	-	-	0.0	-	0.0	-	-	2.0	-	-	1.0	-	0.0	-	1.0	-	0.0	0.0	7.0	-
Post operative facial weakness	-	-	0.0	-	0.0	-	-	0.0	-	-	0.0	-	4.0	-	1.0	-	0.0	0.0	2.0	-
Residual/recurrent disease	6.0	-	7.0	-	1.0	0.0	2.0	0.0	-	-	0.0	4.0	-	-	-	-	0.0	0.0	1.0	-

CWD, canal wall down; CWU, canal wall up; IV, intravenous; BC, bone conduction.

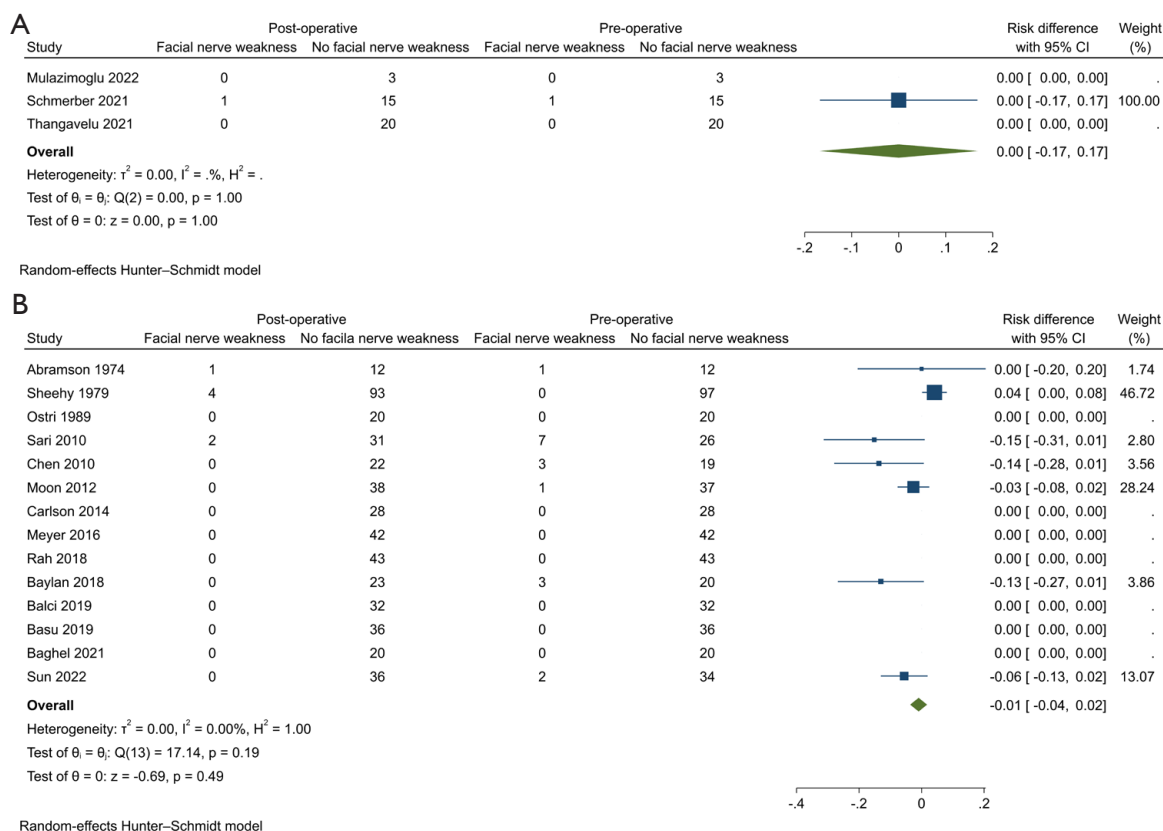
**Table S5** Summary data for microscopic studies part B

Variables	Baylan	Quaranta	Busaba	Yamamoto	Gormley	Baghel	Basu	Parisier	Geerse	Ghiasi	Kitahara	Kobayashi	Hirvonen	Palva	Bo	Rah	Ueda	Chen	Liu
Year	2018 (27)	2009 (41)	1999 (28)	2010 (49)	1986 (53)	2021 (24)	2019 (54)	1991 (5)	2017 (32)	2011 (55)	2014 (35)	1995 (36)	2016 (57)	1971 (58)	2016 (56)	2018 (42)	2009 (47)	2010 (30)	1993 (37)
Sample size	23.0	46.0	34.0	22.0	33.0	20.0	36.0	40.0	45.0	16.0	20.0	8.0	17.0	23.0	21.0	43.0	31.0	22.0	43.0
Lateral semicircular canal fistula	21.0	36.0	32.0	17.0	33.0	19.0	30.0	34.0	42.0	16.0	20.0	7.0	17.0	-	28.0	-	30.0	19.0	36.0
Mean ages in years	26.1	54.6	-	56.7	16-69	31.7	-	48.0	49.0	27.2	52.8	47.5	52.0	-	37.0	55.1	56.0	46.7	29.2
Female	12.0	27.0	11.0	12.0	13.0	9.0	-	17.0	19.0	6.0	11.0	3.0	6.0	-	18.0	12.0	14.0	10.0	20.0
Left side	-	-	-	-	-	-	-	25.0	-	-	9.0	-	-	-	-	20.0	-	-	24.0
Primary surgery	-	-	-	-	-	17.0	-	-	21.0	12.0	-	6.0	13.0	-	-	-	-	-	-
Dornhoffer type I	5.0	-	-	10.0	-	15.0	-	-	-	-	0.0	-	-	-	-	-	23.0	0.0	-
Dornhoffer type IIa	12.0	-	-	0.0	-	-	-	-	-	-	20.0	-	-	-	-	-	0.0	0.0	-
Dornhoffer type IIb	4.0	-	-	2.0	-	-	-	-	-	-	0.0	-	-	-	-	-	7.0	13.0	-
Dornhoffer type III	3.0	-	-	10.0	-	1.0	-	-	-	-	0.0	-	-	-	-	-	1.0	9.0	-
Positive fistula sign	-	-	14.0	-	13.0	2.0	-	9.0	-	-	-	-	-	-	11.0	10.0	20.0	12.0	19.0
CWU	0.0	18.0	0.0	2.0	10.0	8.0	36.0	1.0	19.0	0.0	13.0	-	-	13.0	0.0	1.0	4.0	9.0	4.0
CWD	20.0	28.0	34.0	20.0	23.0	12.0	0.0	39.0	14.0	16.0	7.0	-	-	10.0	35.0	42.0	27.0	13.0	39.0
Fistula sealed	23.0	46.0	34.0	22.0	10.0	20.0	-	31.0	43.0	16.0	18.0	8.0	16.0	10.0	-	37.0	29.0	22.0	6.0
Matrix left intact	0.0	0.0	0.0	0.0	23.0	0.0	-	10.0	0.0	0.0	2.0	0.0	1.0	13.0	-	1.0	2.0	0.0	35.0
Intercurrent ossicular erosion	-	27.0	-	-	-	-	-	25.0	-	-	-	-	-	-	-	6.0	-	-	31.0
Fallopian canal erosion	-	29.0	-	-	9.0	17.0	-	-	-	-	-	-	-	-	-	33.0	-	-	15.0
Topical steroids	-	-	-	-	-	-	-	-	-	-	-	-	11.0	-	-	-	-	-	-
IV steroids	-	-	-	-	-	-	-	-	-	-	-	-	11.0	-	-	-	-	22.0	-
Mean follow up duration	-	-	6.0	-	-	25.0	3.0	48.0	30.0	-	6.0	-	-	-	-	26.1	26.0	-	-
Mean difference in BC threshold	1.2	3.1	-	3.1	-1.1	3.2	-0.3	-	6.4	-	-	-11.8	7.6	-	0.5	9.1	11.7	-3.2	-
Mean pre operative BC threshold	13.0	34.5	-	30.7	20.9	25.8	-	-	20.1	-	-	29.7	28.5	-	22.0	36.6	-	19.4	-
Mean post operative BC threshold	14.2	37.6	-	33.8	19.8	29.0	-	-	26.4	-	-	19.8	36.1	-	22.5	45.6	-	16.2	-
Pre operative deafness	0.0	2.0	3.0	7.0	1.0	0.0	-	6.0	11.0	1.0	0.0	1.0	-	0.0	0.0	0.0	0.0	3.0	2.0
BC threshold improved	2.0	-	3.0	0.0	-	4.0	-	3.0	-	0.0	1.0	2.0	-	8.0	3.0	6.0	7.0	4.0	0.0
BC threshold unchanged	16.0	-	14.0	13.0	-	13.0	-	25.0	24.0	14.0	15.0	4.0	-	12.0	13.0	25.0	17.0	-	36.0
BC threshold worsened	2.0	-	6.0	1.0	-	3.0	-	7.0	2.0	2.0	4.0	0.0	3.0	3.0	5.0	7.0	3.0	-	4.0
Post operative deafness due to surgery	0.0	2.0	8.0	1.0	1.0	0.0	-	-	2.0	0.0	0.0	1.0	-	2.0	0.0	0.0	0.0	0.0	1.0
Preoperative vertigo	-	20.0	19.0	-	21.0	13.0	-	21.0	28.0	6.0	13.0	-	-	-	30.0	18.0	23.0	13.0	29.0
Postoperative vertigo	1.0	-	-	-	-	0.0	-	3.0	0.0	0.0	-	-	-	-	-	-	3.0	0.0	1.0
Pre operative facial weakness	3.0	3.0	-	9.0	-	0.0	0.0	7.0	-	-	-	-	-	1.0	3.0	0.0	2.0	3.0	6.0
Post operative facial weakness	0.0	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	0.0	-	0.0	-
Residual/recurrent disease	0.0	-	-	2.0	-	-	0.0	3.0	6.0	3.0	-	-	-	-	0.0	0.0	-	0.0	-

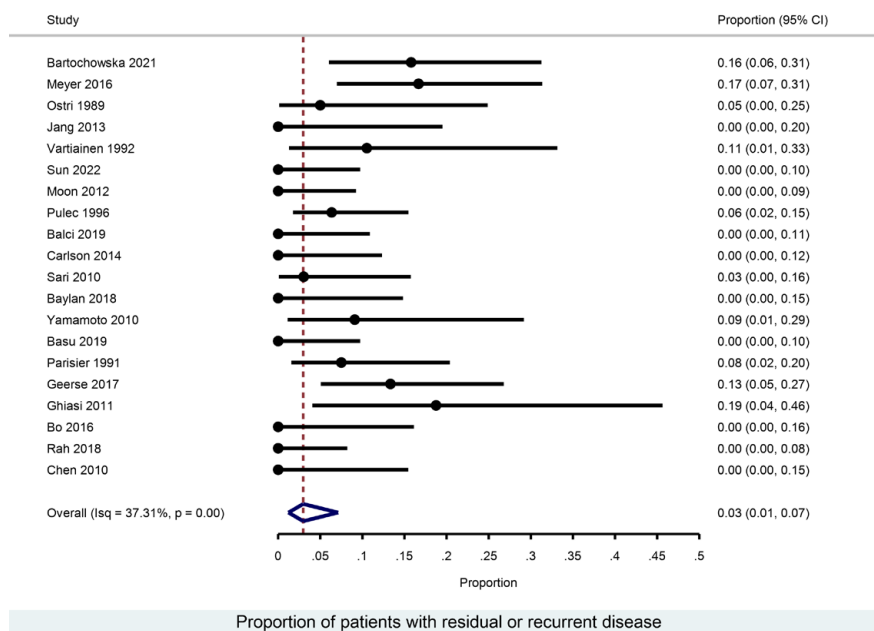
CWD, canal wall down; CWU, canal wall up; IV, intravenous; BC, bone conduction.



**Figure S1** Forest plots of post-operative improvement in bone conduction thresholds for UWEES (A) and microscopic (B) approaches. UWEES, under water endoscopic ear surgery; CI, confidence interval.



**Figures S2** Forest plots of pre- and post-operative difference in facial nerve weakness cases for UWEES (A) and microscopic (B) approaches. UWEES, under water endoscopic ear surgery; CI, confidence interval.



**Figure S3** Forest plot of post-operative residual or recurrent disease cases for microscopic approach. CI, confidence interval.