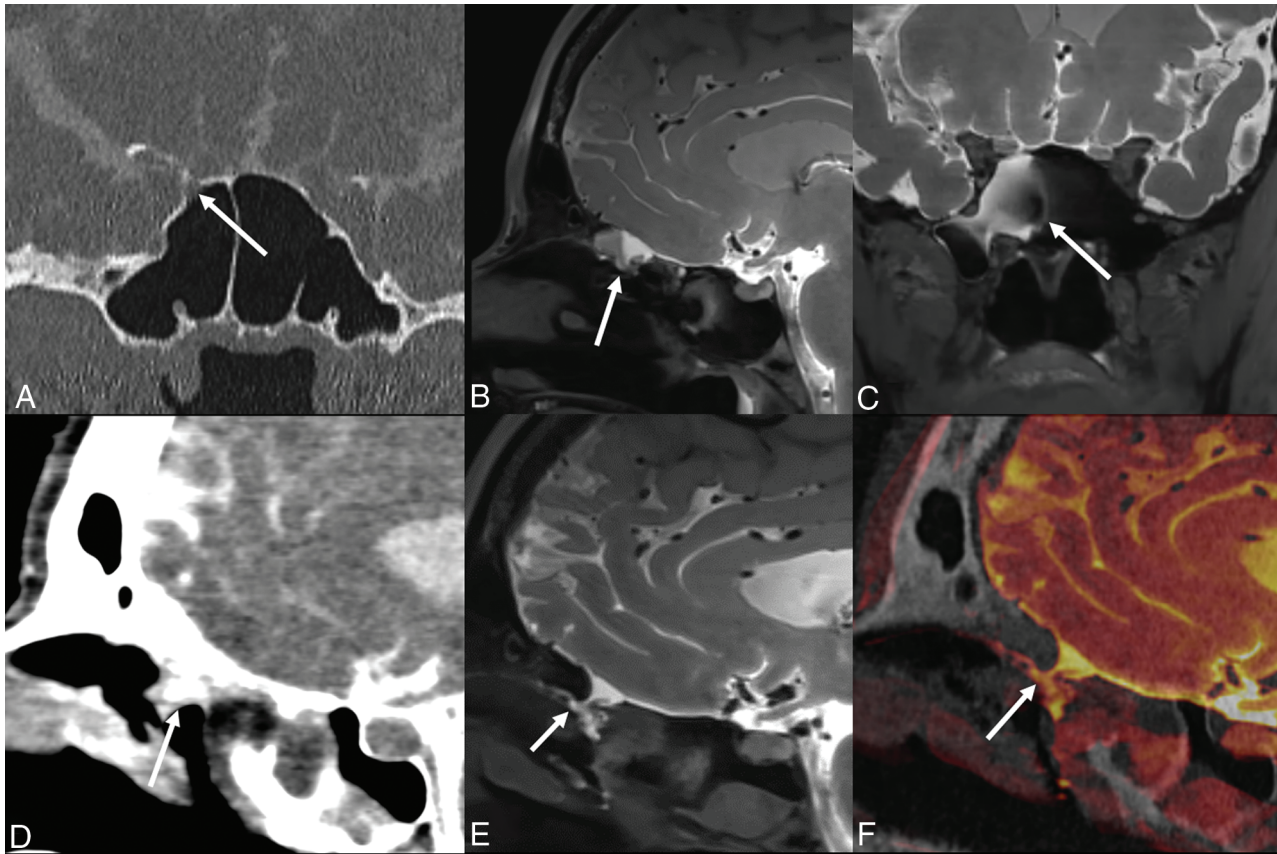


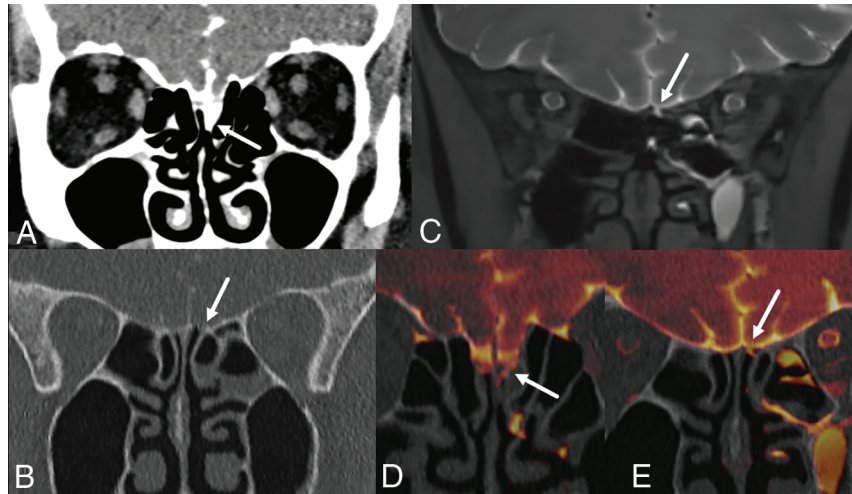
On-line Table: Summary of patients

Patient #	Age/ Sex	Cisternography Study #	CSF Leak/Location on CT Cisternography	CSF Leak/Etiology	Bony Defect/Location on CT Cisternography	CSF Leak/Location on MR Cisternography	CSF Leak/Location at Surgery	Figure/Video #
1	55/F	1	No/NA	Spontaneous/recurrent after previous surgery	No/NA	Yes/left anterior cribriform plate	Yes/left anterior cribriform plate	Fig 1
2	69/F	Study 1	Falsely located/contrast media in right sphenoid sinus but no clear CSF leak	Spontaneous/postoperative (endoscopic surgery maxillary sinus)	Yes/roof of right sphenoid sinus	Yes/right cribriform plate	Yes/right floor of anterior cranial fossa	On-line Fig 1A–C
		Study 2	Equivocal/suspected at right cribriform plate, diffuse contrast media in right ethmoid and sphenoid sinus	Recurrent leak after surgical repair	Yes/roof of right sphenoid sinus	Yes/right cribriform plate	Yes/right cribriform plate	On-line Fig 1D–F, Online Video 1
3	59/F	1	Equivocal/suspected at the deeply located left olfactory sulcus	Spontaneous	Yes/left olfactory sulcus	Yes/left olfactory sulcus + left cribriform plate	Yes/left cribriform plate	On-line Fig 2
4	47/F	1	Equivocal/suspected at right anterior sphenoid bone	Postoperative/after RT: pituitary adenoma	Yes/right anterior sphenoid bone	Yes/right anterior sphenoid bone	Yes/right anterior sphenoid bone	-
5	62/F	1	Yes/posteromedial left mastoid temporal bone	Postoperative/after RT: recurrent vestibular schwannoma	Yes/left posteromedial mastoid temporal bone	Yes/posteromedial left mastoid temporal bone	Yes/posteromedial left mastoid temporal bone	On-line Video 2
6	45/M	1	Yes/inferolateral recess of left sphenoid sinus + associated encephalocele	Spontaneous encephalocele	Yes/anterior floor of left temporal fossa (multiple)	Yes/inferolateral recess of left sphenoid sinus + associated encephalocele	Yes/inferolateral recess of left sphenoid sinus + associated encephalocele	On-line Fig 3
7	38/M	1	Yes/medioinferior left mastoid temporal bone	Postoperative: vestibular schwannoma	Yes/medioinferior left mastoid temporal bone	Yes/medioinferior left mastoid temporal bone	Yes/medioinferior left mastoid temporal bone	On-line Fig 4

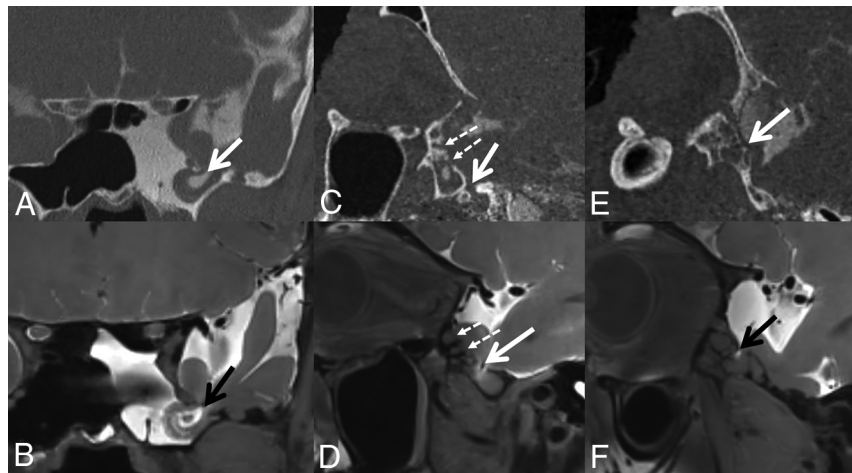
Note:—CT indicates MR cisternography imaging and surgical findings; F, female; M, male; NA, not applicable; RT, radiation therapy.



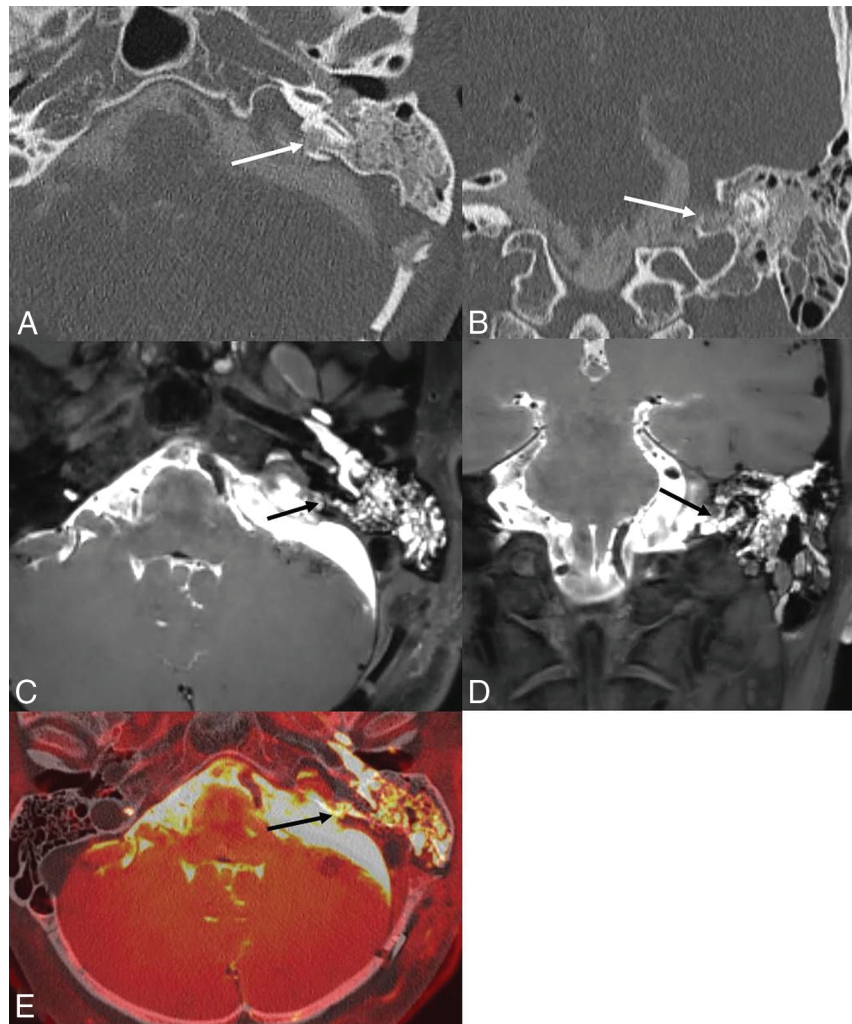
ON-LINE FIG 1. A 69-year-old woman (patient 2) presents with a history of right breast carcinoma and synchronous multiple myeloma. Two weeks before presentation, she had an upper respiratory tract infection. One week later, clear right-sided CSF rhinorrhea developed. The only preceding surgical intervention was maxillary sinus surgery 9 months earlier. Study 1: A–C, CT cisternography images (soft tissue window level, not shown) do not reveal accurate site of leakage while showing only contrast media accumulation in the ethmoid complex and a suspicious focal area of bony thinning at the roof of sphenoidal sinus (bone window level, W: 2000; L:500; A, *arrow*). CS SPACE MR cisternography depicts contrast media leakage anterior to the sphenoid sinus at the right cribriform plate into the posterior ethmoidal air cells (B, *arrow*). Moreover, in study 1, MR cisternography obtained with the patient in the supine position shows posterior-dependent contrast media accumulation with fluid level in right sphenoid sinus (C, *arrow*) and posterior ethmoidal air cells. Subsequent endonasal endoscopic surgery with additional application of intrathecal fluorescein was performed. Intraoperatively, there was primarily the impression of a leak in the sphenoid sinus. However, further exposure of the anterior base of the skull revealed a ventrally located diffuse CSF flow without a clear osseous defect, which was covered broadly with fibrin glue. After surgery, CSF rhinorrhea recurred. Combined CT and MR cisternography was repeated to precisely depict the site of leakage. Study 2: D–F, CT cisternography (D; soft tissue window level, W: 350; L:50) again only shows diffuse contrast media accumulation in the ethmoid complex below the anterior cranial fossa (D, *arrow*) with diffuse bone thinning at the anterior cribriform plate, failing to reveal the exact site of CSF leakage. In study 2, CS SPACE MR cisternography discloses a fine tubular contrast media leakage through the right cribriform plate with subsequent contrast media accumulation in posterior ethmoid air cells (E, *arrow*). Sagittal MR imaging and CT cisternography fusion image points to the tubular contrast media leakage and the contrast media accumulation in posterior ethmoidal air cells (F, *arrow*). A second endonasal endoscopic surgical repair procedure was performed, and the site of leakage could be confirmed (On-line Video file 1) and repaired.



ON-LINE FIG 2. A 59-year-old woman (patient 3) presents with recurrent left CSF rhinorrhea for the previous 2 years. She had no history of previous head or neck surgery, cranial trauma, or infection. Subsequent combined CT and MR cisternography was performed. Coronal CT cisternography images (A: soft tissue window level, W: 350; L: 5; and B: bone window level, W: 4000; L: 700) show deep location of left olfactory sulcus compared with the right side (A, arrow) and small bony defect at the olfactory sulcus (B, arrow) without any detectable CSF leak. CS SPACE MR cisternography images clearly depicted CSF leakage at the left olfactory groove and cribriform plate and a second suspected site of leakage more posteriorly at the planum sphenoidale (C, arrow). Coronal MR imaging and CT cisternography fusion images point to tubular contrast media leakages at the deep-lying left olfactory sulcus (D, arrow) and posteriorly into the upper nasal cavity (E, arrow). For CSF fistula repair, an endonasal endoscopic surgical procedure with additional application of intrathecal fluorescein was performed. The site of the leakage at the deep-lying left olfactory sulcus could be confirmed. However, further exposure did not show active CSF leakage at the olfactory sulcus. After surgery, the patient was free of CSF rhinorrhea.



ON-LINE FIG 3. A 45-year-old man (patient 6) presents with spontaneous left CSF rhinorrhea. CT and MR cisternography clearly illustrate an osseous defect at the anterior medial temporal fossa with contrast media leakage into the left sphenoid sinus and an associated large anteromesial temporal encephalocele (A and B, arrows). Moreover, multiple smaller encephaloceles herniating into osseous defects of the ala major of the sphenoid bone but without associated CSF leaks are depicted (C and D, dotted arrows; D–F, arrows).



ON-LINE FIG 4. A 38-year-old man (patient 7) presents with left CSF rhinorrhea after resection of a recurrent left vestibular schwannoma. CT cisternography shows osseous defect at medioinferior portion of left petrous temporal bone (A and B, *arrows*) and contrast media accumulation inside mastoid air cells. CS SPACE MR cisternography clearly illustrates contrast media leakage through the bony defect into the left mastoid air cells (C and D, *arrows*) and tympanic cavity and anteriorly into the Eustachian tube. Both the leak and the bony defect are disclosed on CT/MR cisternography fusion image (E, *arrow*).