

Influence of molecular subtypes of breast cancer on surgical outcomes of patients undergoing brain metastases (BM) surgery [Abstract]

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dysfunction (n=1), with no infections observed. Kaplan–Meier analysis demonstrated durable revision-free survival. The median revision-free interval was not reached, indicating sustained shunt function in most patients, with only isolated late failures beyond 10 years. Among 37 patients completing SF-12 surveys, physical and mental component scores remained stable postoperatively (PCS p=0.89; MCS p=0.82).

Conclusions: SSS is a safe, effective, and durable procedure for selected patients with syringomyelia, achieving high rates of radiological and clinical improvement with low morbidity and sustained quality of life. When the subarachnoid space is preserved, SSS should be considered a first-line surgical option, with outcomes comparing favourably to published meta-analytic benchmarks.

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Session 76: Joined session CSF & Pediatric, October 2, 2026, 6:00 PM - 7:00 PM

Brain and Spine 6 (2026) 106891

The Importance Of Post-Operative Cerebrospinal Fluid Flow Dynamics In Patients With Chiari I And Complex Malformation At Risk Of Early Surgical Revision

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To quantify the predictive value of post-operative cerebrospinal fluid (CSF) dynamics on clinical and morphological outcomes following osteo-dural posterior fossa decompression with tonsillar coarctation (DOPD + C) in Chiari Malformation Type I (CM-I) and Chiari Complex (1.5) with or without syringomyelia.

Methods: We conducted a retrospective analysis of 48 patients (mean age 42.7 years) who underwent DOPD + C from 2018 to 2025. Clinical post-operative status was assessed using the Chicago Chiari Outcome Scale (CCOS). CSF dynamics were evaluated via post-operative cine phase-contrast MRI (PC-MRI). Statistical analysis employed both frequentist (Firth penalized regression) and Bayesian frameworks to determine the association between flow restoration, clinical recovery, and syrinx resolution.

Results: Post-operative CSF dynamics were successfully restored or improved in 77.1% (n=37) of patients. A near-deterministic association was observed between hydrodynamic restoration and clinical success (96.2% success rate in the restored group vs. 28.6% in the stationary group; OR = 62.5, 95% CI: 6.8–1466, p<0.001). Bayesian analysis yielded a BF10>90,000, providing "decisive evidence" for the predictive power of CSF dynamics. Furthermore, a "Symptom Dissociation" Paradox was identified: Reduced dynamics correlated with Exertion Headache (OR=6.9, p=0.008), while Absent dynamics ("Silent Block") predicted Long Tract Signs (OR=4.9, p=0.031). Age independently predicted neurological deficits (OR = 1.06 per year, p=0.026) and high-tension syringomyelia (Vaquero Index > 0.5, p=0.032).

Conclusions: Restoration of pulsatile CSF flow at the foramen magnum is the primary mechanistic determinant of surgical success in CM-I and Chiari Complex. The identification of the "Silent Block" phenotype and the age-dependent accrual of neurological damage (6.0% annual increase) underscore the necessity of early surgical intervention and the mandatory use of post-operative PC-MRI as the gold-standard prognostic biomarker. The results suggest that it should be used in post-operative follow-up to early identify patient who could not relieve symptoms and require surgical re-exploration.

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Session 76: Joined session CSF & Pediatric, October 2, 2026, 6:00 PM - 7:00 PM

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Natural history of supratentorial arachnoid cysts in adults: a longitudinal cohort study

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Intracranial arachnoid cysts (ACs) are usually incidental findings on cranial imaging, yet their long-term natural history remains incompletely characterized, resulting in uncertainty regarding their natural course. This study aimed to describe the demographic, radiological, and clinical characteristics, as well as the longitudinal volumetric changes of supratentorial ACs.

Methods: This retrospective single-centre cohort study included adult (>17 years) patients with radiologically confirmed supratentorial ACs between 2012 and 2022. Baseline cyst characteristics and clinical data were collected. In patients with follow-up imaging, longitudinal volumetric assessment was performed. A ≥20% change in cyst volume was predefined as a relevant volumetric alteration.

Results: Among 1431 patients with intracranial ACs, 851 (60.4%) had at least one supratentorial AC, yielding 888 supratentorial ACs for analysis. Mean age at diagnosis was 59.5 ± 19.6 years, and 59.5% were male. The most common locations were the middle cranial fossa (57.4%) and the convexity (29.7%). 15 patients (1.7%) presented with symptoms considered likely attributable to the cyst and 16 patients (1.8%) underwent surgical treatment. Clinical follow-up was available in 578 patients (66.8%), repeat imaging in 373 (43.1%). Over a mean follow-up of 4.8 ± 4.2 years, the volume remained stable in 50.9%, decreased in 16.4%, and increased in 32.7%. Among the patients with cyst enlargement, only 6 patients (4.9%) developed symptoms potentially related to the cyst.

Conclusions: In this cohort, clinically attributable symptoms and surgical intervention were rare among patients with supratentorial ACs. Volumetric analysis indicated that dynamic changes in cyst size are relatively frequent; however, such changes were rarely associated with new related symptoms. These findings provide quantitative longitudinal data on cyst behavior and underscore the value of volumetric assessment in future studies evaluating the clinical relevance of cyst size dynamics and furthermore indicate that surgery and systematic follow-up examinations might not be necessary for asymptomatic patients.

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Session 77: Brain Metastases and fundamental research, October 3, 2026, 8:00 AM - 9:30 AM

Brain and Spine 6 (2026) 106893

Influence of Molecular Subtypes of Breast Cancer on Surgical Outcomes of Patients undergoing Brain Metastases (BM) Surgery

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This study investigates how different molecular subtypes of breast cancer (HER2

+, luminal-like, and triple-negative) influence outcomes in patients undergoing BM surgery.

Methods: We retrospectively evaluated clinical characteristics, survival and functional outcomes of 565 patients from 13 tertiary neurosurgical centers.

Results: The distribution of molecular subtypes was 45.5% HER2+, 28.7% luminal-like, and 25.8% triple-negative. Significant molecular subtype switching was frequently observed in BM tissue: 17.3% (44/254) gained HER2+ expression, while 21.9% (54/247) and 12.8% (38/297) showed changes in estrogen and progesterone receptor status, respectively. HER2+ tumors were more frequently located infratentorially (44.5% vs. 31.8% luminal-like and 27.9% triple-negative; $p=0.002$) and presented with higher GPA scores (3–4) (59.2% vs. 36.2% luminal-like and 33.4% triple-negative; $p<0.001$). Subgroups did not differ significantly regarding postoperative ECOG status or complication rates. Median overall survival (mOS) for the entire cohort was 20.6 months, varying significantly by subtype (HER2+: 30.4, luminal-like: 18.6, triple-negative: 13.1 months; $p<0.001$). The one-year CNS recurrence rate was 63.0% for HER2+, 62.7% for luminal-like, and 73.0% for triple-negative tumors. Resection of all BM favored OS in HER2+ (52.5 vs. 32.6 months, $p=0.033$) and triple-negative cases (21.0 vs. 9.5 months, $p=0.001$).

Conclusions: Molecular subtypes influence the incidence of BM; the most common primary breast cancer subtype (luminal-like) was underrepresented in our series. Subtypes impact both OS and recurrence rates. Survival in the present cohort was much better when compared to series not selected for surgery (i.e., mOS of HER2+ cases: 13.2, luminal-like: 6.1 and triple-negative: 4.5 months; Riecke et al., 2023). The strong survival benefit seen in triple-negative breast cancer cases when all tumors were removed suggests a particularly important role for surgery in such cases. Frequent molecular subtype switching underscores the importance of BM tissue analysis to identify targets for novel CNS-penetrant drugs.

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Session 77: Brain Metastases and fundamental research, October 3, 2026, 8:00 AM - 9:30 AM

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Primary Tumor Origin Drives Survival After Stereotactic Radiosurgery for Gynecologic Brain Metastases: An Individual Patient Data Meta-Analysis

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Brain metastases from gynecologic malignancies are rare and associated with poor prognosis. Stereotactic radiosurgery (SRS) is frequently used for intracranial disease control; however, survival outcomes vary and appear to depend on the primary tumor site. Evidence to guide prognostication remains limited due to small, heterogeneous cohorts.

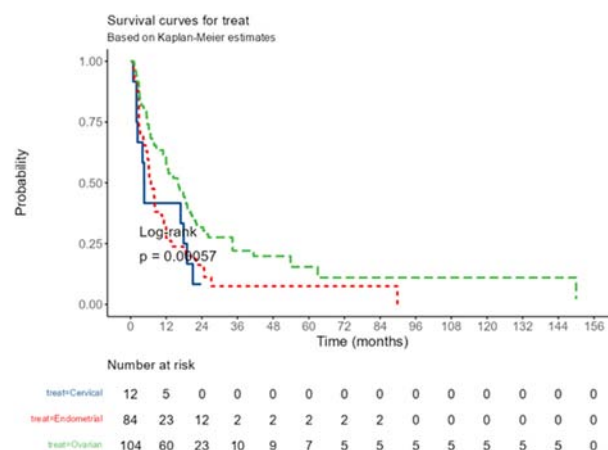
Methods: This study followed PRISMA-IPD guidelines and involved a systematic identification of eligible studies reporting outcomes of patients with brain metastases from gynecologic cancers treated with SRS. Individual patient data were requested, harmonized, and pooled across studies. Overall survival was the primary outcome. Survival was estimated using Kaplan–Meier methods and compared across primary tumor sites using the log-rank test. Univariable Cox proportional hazards models were used to estimate hazard ratios (HRs) with 95% confidence intervals (CIs). Predefined subgroup analyses were performed according to primary tumor origin.

Results: Individual patient data from 200 patients were included: 12 with cervical, 84 with endometrial, and 104 with ovarian cancer. Overall survival differed significantly by primary site (log-rank $p = 0.00057$). Median overall survival was longest in ovarian cancer (16.0 months; 95% CI: 11.9–19.1), followed by endometrial (6.8 months; 95% CI: 5.8–9.7) and cervical cancer (4.6 months; 95% CI: 2.3–not estimable). Univariable Cox regression revealed that ovarian cancer was associated with a 50% reduction in the risk of death compared to cervical cancer (HR 0.50; 95% CI: 0.26–0.94; $p=0.031$). Five-year survival was observed in 15.5% of ovarian and 7.5% of endometrial cancer patients, with no cervical cancer survivors beyond 24 months.

Conclusions: In this IPD meta-analysis, survival after SRS for brain metastases from gynecologic malignancies varied markedly by primary tumor site. Ovarian cancer was associated with significantly superior outcomes, highlighting the prognostic importance of tumor origin and supporting individualized treatment

strategies.

Optional Image



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Session 77: Brain Metastases and fundamental research, October 3, 2026, 8:00 AM - 9:30 AM

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TTF1-negative lung adenocarcinoma brain metastases undergo transcriptional reprogramming with increased invasiveness, tumor aggressivity, and shorter survival

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Thyroid transcription factor 1 (NKX2-1/TTF-1) is frequently expressed in lung adenocarcinoma (LUAD). Based on studies on primary tumors, NKX2-1/TTF-1 plays a key role in the progression of lung cancer, and its loss is linked to overexpression of cell proliferation, migration, invasiveness, and dedifferentiation genes. Its impact on survival in patients undergoing surgical resection for LUAD brain metastases (BM) and the biological rationale remain insufficiently characterized.

Methods: BM biopsies were prospectively collected, and NKX2-1/TTF-1 expression was determined by immunohistochemical staining of formalin-fixed, paraffin-embedded tissue sections, following the diagnosis of LUAD BM between 2021 and 2024. Differential gene expression between TTF-1-positive and -negative samples was analyzed by qPCR following RNA extraction and reverse transcription, focusing on six NKX2-1/TTF-1 regulated genes (MYBPH, ROR1, LMO3, TGFB, SNAI2, and SNAI1), with normalization to housekeeping genes and quantification using the $\Delta\Delta C_t$ method. Baseline characteristics included sex, age, preoperative Karnofsky Performance Status (KPS), metastatic status, metastatic timing, and lesion location. Outcomes included overall survival (OS).

Results: We collected 45 patients (17 female, 28 male) with a median age of 65.7 years (range: 37.7–86.0 years) and a median KPS of 80 (range 40–90). NKX2-1/TTF-1 expression was present in 27 patients (60.0%). Baseline characteristics were well balanced between NKX2-1/TTF-1-positive and -negative groups, with no significant differences in sex distribution ($p=0.900$), age ($p=0.609$), preoperative KPS ($p=0.853$), metastasis timing and status ($p=0.616$, $p=0.438$), lesion location and laterality ($p=0.879$, $p=0.593$), or extent of resection ($p=0.648$). TTF1-negative patients had significantly shorter OS ($p=0.0021$). Linear regression analyses showed no significant association between OS and preoperative KPS ($p=0.347$) or age ($p=0.197$). LMO3, ROR1, SNAI1, and SNAI2 were significantly upregulated in NKX2-1/TTF-1 negative tumors ($p<0.001$, $p=0.0005$, $p=0.0489$ and $p=0.0066$), while MYBPH showed no significant association ($p=0.3011$) and TGF β 1 demonstrated a non-significant overexpression trend ($p=0.0666$).

Conclusions: NKX2-1/TTF-1 negativity emerged as an independent predictor of