Endoscopic third ventriculostomy and choroid plexus cauterization

Endoscopic third ventriculostomy with choroid plexus cauterization (ETV/CPC) offers an alternative to shunt.

A repeat endoscopic third ventriculostomy and choroid plexus cauterization can be an effective salvage surgery in the event of ETV failure [1].

While ventriculoperitoneal shunt (VPS) insertion is the standard treatment for myelomeningocele-associated hydrocephalus (MAH), it can be complicated by shunt infection and shunt malfunction. As such, endoscopic third ventriculostomy (ETV), with or without choroid plexus coagulation (CPC), has been proposed as an alternative.

ETV+CPC was associated with a higher success rate than ETV alone for MAH in a meta-analysis of published studies. ETV, with or without CPC, was technically feasible and safe for this patient population [2].

In the twenty-first century, choroid plexus cauterization (CPC) in combination with endoscopic third ventriculostomy (ETV) has emerged as an effective treatment for some infants with hydrocephalus, leading to the favourable condition of 'shunt independence'.

Coulter et al. provide a narrative technical review considering the indications, procedural aspects, morbidity and its avoidance, postoperative care and follow-up. The CP has been the target of hydrocephalus treatment for more than a century. Early eminent neurosurgeons including Dandy, Putnam and Scarff performed CPC achieving generally poor results, and so the procedure fell out of favour. In recent years, the addition of CPC to ETV was one of the reasons greater ETV success rates were observed in Africa, compared to developed nations, and its popularity worldwide has since increased. Initial results indicate that when ETV/CPC is performed successfully, shunt independence is more likely than when ETV is undertaken alone. CPC is commonly performed using a flexible endoscope via septostomy and aims to maximally cauterize the CP. Success is more likely in infants aged >1 month, those with hydrocephalus secondary to myelomeningocele and aqueductal obstruction and those with >90% cauterized CP. Failure is more likely in those with post-haemorrhagic hydrocephalus of prematurity (PHHP), particularly those <1 month of corrected age and those with prepontine scarring. High-quality evidence comparing the efficacy of ETV/CPC with shunting is emerging, with data from ongoing and future trials offering additional promise to enhance our understanding of the true utility of ETV/CPC [3].

In the quest to identify the optimal means of Cerebrospinal fluid shunt free of shunt dependency, endoscopic third ventriculostomy (ETV) with choroid plexus cauterization (CPC) has been proposed as a promising procedure in select children. Supplementing traditional ETV with obliteration of the choroid plexus has been shown to decrease the likelihood of ultimate shunt dependency by roughly 20%. Originally devised to treat hydrocephalus in infants in sub-Saharan Africa, ETV/CPC has gained

eager attention and cautious support in the developed world [4].

Diagnosing treatment failure is dependent on infantile hydrocephalus metrics, including head circumference, fontanel quality, and ventricle size.

Systematic review

Systematic review was performed using four electronic databases and bibliographies of relevant articles, with no language or date restrictions. Cohort studies of participants undergoing ETV/CPC that reported outcome were included using MOOSE guidelines. The outcome was time to repeat CSF diversion or death. Forest plots were created for pooled mean and its 95 % CI of outcome and morbidity.

Of 78 citations, 11 retrospective reviews (with 524 total participants) were eligible. Efficacy was achieved in 63 % participants at follow-up periods between 6 months and 8 years. Adverse events and mortality was reported in 3.7 and 0.4 % of participants, respectively. Publication bias was detected with respect to efficacy and morbidity of the procedure. A large discrepancy in success was identified between ETV/CPC in six studies from sub-Saharan Africa (71 %), compared to three studies from North America (49 %).

The reported success of ETV/CPC for infantile hydrocephalus is higher in sub-Saharan Africa than developed nations. Large long-term prospective multi-center observational studies addressing patient-important outcomes are required to further evaluate the efficacy and safety of this re-emerging procedure [5].

Case series

Endoscopic third ventriculostomy and choroid plexus cauterization case series.

1)
Kono M, Tsuda K, Yamashita M, Ihara S. Repeat endoscopic third ventriculostomy combined with choroid plexus cauterization as salvage surgery for failed endoscopic third ventriculostomy. Childs Nerv Syst. 2022 Apr 19. doi: 10.1007/s00381-022-05488-6. Epub ahead of print. PMID: 35438316.
2)
Omar AT, Espiritu AI, Spears J. Endoscopic third ventriculostomy with or without choroid plexus coagulation for myelomeningocele-associated hydrocephalus: systematic review and meta-analysis. J Neurosurg Pediatr. 2022 Jan 21:1-9. doi: 10.3171/2021.11.PEDS21505. Epub ahead of print. PMID: 35061994.
3)
Coulter IC, Dewan MC, Tailor J, Ibrahim GM, Kulkarni AV. Endoscopic third ventriculostomy and choroid plexus cauterization (ETV/CPC) for hydrocephalus of infancy: a technical review. Childs Nerv Syst. 2021 May 15. doi: 10.1007/s00381-021-05209-5. Epub ahead of print. PMID: 33991213.
4)
Dewan MC, Naftel RP. The Global Rise of Endoscopic Third Ventriculostomy with Choroid Plexus Cauterization in Pediatric Hydrocephalus. Pediatr Neurosurg. 2016 Dec 22. doi: 10.1159/000452809. [Epub ahead of print] PubMed PMID: 28002814.
5)
Weil AG, Westwick H, Wang S, Alotaibi NM, Elkaim L, Ibrahim GM, Wang AC, Ariani RT, Crevier L,

Myers B, Fallah A. Efficacy and safety of endoscopic third ventriculostomy and choroid plexus cauterization for infantile hydrocephalus: a systematic review and meta-analysis. Childs Nerv Syst. 2016 Nov;32(11):2119-2131. PubMed PMID: 27613635.