Craniosynostosis case series

2023

A total of 104 pediatric syndromic and non-syndromic patients who were operated on because of single- or multiple-suture craniosynostosis were included in this study. The mean volumetric CT dose index (CTDIvol) and dose-length product (DLP) values of optimized craniosynostosis CT examinations (58 MSCT and 46 CBCT) were compared. Two surgeons evaluated the subjective image quality.

CBCT resulted in significantly lower CTDIvol (up to 14%) and DLP (up to 33%) compared to MSCT. Multi-slice CT image quality was considered superior to CBCT scans. However, all scans were considered to be of sufficient quality for diagnosis.

The O-arm device allowed for an immediate postoperative CBCT examination in the operating theater using the same anesthesia induction. Radiation exposure was lower in CBCT compared to MSCT scans, thus further encouraging the use of O-arms. Cone-beam CT imaging with an O-arm is a feasible method for postoperative craniosynostosis imaging, yielding less anesthesia to patients, lower health costs and the possibility to immediately evaluate results of the surgical operation [1].

All children with non-syndromic single-suture craniosynostosis operated on from January 2014 to January 2017 were enrolled. A comprehensive neurocognitive and neuro-ophthalmological evaluation was performed before surgery and 6 months after surgery. A further neurocognitive evaluation was performed 12 months after surgery. All children had a preoperative CT/MR study.

One hundred forty-two patients were enrolled; 87 are affected by sagittal craniosynostosis, 38 by trigonocephaly, and 17 by plagiocephaly. A global neurocognitive impairment was documented in 22/87 children with scaphocephaly, 5/38 children with trigonocephaly, and 6/17 children with anterior plagiocephaly. There was a significant relationship between results of the ophthalmological evaluation, global IQ, and CT findings at diagnosis ($r = 0.296$, $p < 0.001$; $r = 0.187$, p 0.05). Though a significant recovery was documented after surgery, a persistence of eye coordination deficits was present at 6 months in 1 out of 3 children with abnormal preoperative exams. A significant correlation was found between pathological CT findings and persistence of below average neuro-ophthalmological and neurocognitive findings 6 months after surgery, as well as between CT findings and neurocognitive scores at the 1 year follow-up ($r = 0.411$; $p < 0.01$).

The presence of neuroradiological abnormalities appears to be related to both ophthalmological and neurocognitive deficits at diagnosis. This relationship is maintained in spite of the surgical treatment in children who show the persistence of ophthalmological and neurocognitive deficits during the follow-up [2].

A retrospective review was conducted on craniosynostosis patients who had invasive intracranial pressure measurement and at least one pattern visual evoked potentials test. Reversal pattern visual evoked potentials were performed with both eyes open. Thirteen patients met the inclusion criteria (mean age at intracranial pressure measurement, 5.7 years). Seven patients had raised intracranial pressure, and of these, five (71.4 percent) had abnormal or deteriorated pattern visual evoked

potentials parameters on serial testing, whereas all patients (100 percent) with normal intracranial pressure had normal pattern visual evoked potentials amplitude and latency. Four of the five patients (80 percent) with raised intracranial pressure and abnormal pattern visual evoked potentials did not show evidence of papilledema. The mean latency in patients with raised intracranial pressure (118.7 msec) was longer than in those with normal intracranial pressure (108.1 msec), although it did not reach statistical significance ($p = 0.09$), whereas the mean amplitude in patients with raised intracranial pressure (12.4 μV) was significantly lower than in patients with normal intracranial pressure (23.3 μV) ($p = 0.03$). The authors' results showed that serial pattern visual evoked potentials testing was able to detect visual pathway dysfunction resulting from raised intracranial pressure in five of seven craniosynostosis patients, and of these five patients, 80 percent had no evidence of papilledema, demonstrating the utility of serial pattern visual evoked potentials in follow-up of the visual function in craniosynostosis patients. CLINICAL QUESTION/LEVEL OF EVIDENCE:: Diagnostic, II [3)].

Of 3415 patients, 65.8% were White, 21.4% were Hispanic, and 3.2% were Black. More than 96% were treated at urban teaching hospitals and 54.2% in southern or western regions. White patients were younger (mean 6.1 months) as compared with Blacks (mean 10.9 months) and Hispanics (mean 9.1 months; $p < 0.0001$) at the time of surgery. A higher fraction of Whites had private insurance (70.3%) compared with nonwhites (34.0%-41.6%; $p < 0.001$). Approximately 12.2% were nonelective admissions, more so among Blacks (16.9%). Mean hospital length of stay (LOS) was 3.5 days with no significant differences among races. Following surgical treatment, 12.1% of patients developed complications, most commonly pulmonary/respiratory (4.8%), wound infection (4.4%), and hydrocephalus (1.4%). The mean overall hospital charges were significantly lower for Whites than nonwhites ($34,527 vs $44,890-$48,543, respectively; $p < 0.0001$).

The findings of this national study suggest a higher prevalence of craniosynostosis in Hispanics. The higher predisposition among males was less evident in Hispanics and Blacks. There was a significant percentage of nonelective admissions, more commonly among Blacks. Additionally, Hispanics and Blacks were more likely to receive surgery at an older age, past the current recommendation of the optimum age for surgical intervention. These findings are likely associated with a lack of early detection. Although mean LOS and rate of complications did not significantly differ among different races, nonwhites had, on average, higher hospital charges of $10,000-$14,000. This discrepancy may be due to differences in type of insurance, craniosynostosis type, rates of comorbidities, and delay in treatment. Although there are several limitations to this analysis, the study reports on relevant disparities regarding a costly neurosurgical intervention, and ways to diminish these disparities should be further explored [4)].

1)
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2)
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3)
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4)

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