Phosphorus 32 for craniopharyngioma

Radioactive phosphorus 32 (P32) has been used as brachytherapy for craniopharyngioma treatment with the hope of providing local control of enlarging tumor cysts. Brachytherapy has commonly been used as an adjunct to the standard treatment of surgery and external beam radiation (EBR). Historically, multimodal treatment, including EBR, has shown tumor control rates as high as 70% at 10 years after treatment. However, EBR is associated with significant long-term risks, including visual deficits, endocrine dysfunction, and cognitive decline. Theoretically, brachytherapy may provide focused local radiation that controls or shrinks a symptomatic cyst without exposing the patient to the risks of EBR.

Thirty-two patients with recurrent craniopharyngioma underwent phosphorus-32 colloid interstitial radiotherapy. The tumor imaging features were classified into 4 types according to the thickness of the cyst wall and signals of the cyst contents as shown by computed tomography (CT) and magnetic resonance imaging (MRI) images. Protein expressions of VEGF and VEGFR2 in craniopharyngioma tissues were evaluated with immunohistochemistry before radiotherapy. The tumor radiosensitivity was determined at 12 months after the interstitial radiotherapy.VEGF mainly expressed in the tumor cytoplasm, and VEGFR-2 expressed either in vascular endothelial cells or in tumor endothelial cells. VEGF/VEGFR-2 expressions varied significantly in cases sensitive or insensitive to the radiotherapy (VEGF: P=.028; VEGFR-2: P=.017). Tumor imaging features were associated with the therapeutic efficacy of interstitial radiotherapy (P=.000). VEGF expression had no association with the imaging features of tumors (P=.226), but VEGFR-2 expression was associated with the imaging features of tumors (P=.008).Our results confirmed the association among imaging features, VEGFR-2 expressions, and tumor radiosensitivity in craniopharyngiomas. Imaging features and VEGFR-2 expressions may add useful data to the radiosensitive assessment of craniopharyngiomas [1)].

Ansari et al., reviewed their experiences with craniopharyngioma patients treated with P32 brachytherapy as the primary treatment without EBR. The authors reviewed these patients' records to evaluate whether this strategy effectively controls tumor growth, thus avoiding the need for further surgery or EBR.

Ansari et al performed a retrospective review of pediatric patients treated for craniopharyngioma between 1997 and 2004. This was the time period during which the authors' institution had a relatively high use of P32 for treatment of cystic craniopharyngioma. All patients who had surgery and injection of P32 without EBR were identified. The patient records were analyzed for complications, cyst control, need for further surgery, and need for future EBR.

Thirty-eight patients were treated for craniopharyngioma during the study period. Nine patients (23.7%) were identified who had surgery (resection or biopsy) with P32 brachytherapy but without initial EBR. These 9 patients represented the study group. For 1 patient (11.1%), there was a complication with the brachytherapy procedure. Five patients (55.5%) required subsequent surgery. Seven patients (77.7%) required subsequent EBR for tumor growth. The mean time between the injection of P32 and subsequent treatment was 1.67 ± 1.50 years (mean ± SD).

In this small but focused population, P32 treatment provided limited local control for cyst growth. Brachytherapy alone did not reliably avert the need for subsequent surgery or EBR [2)].

1)
Hu C, Chen J, Meng Y, Zhang J, Wang Y, Liu R, Yu X. Phosphorus-32 interstitial radiotherapy for recurrent craniopharyngioma: Expressions of vascular endothelial growth factor and its receptor-2 and imaging features of tumors are associated with tumor radiosensitivity. Medicine (Baltimore). 2018 Jun;97(26):e11136. doi: 10.1097/MD.0000000000011136. PubMed PMID: 29952957.
2)
Ansari SF, Moore RJ, Boaz JC, Fulkerson DH. Efficacy of phosphorus-32 brachytherapy without external-beam radiation for long-term tumor control in patients with craniopharyngioma. J Neurosurg Pediatr. 2016 Apr;17(4):439-45. doi: 10.3171/2015.8.PEDS15317. Epub 2015 Dec 18. PubMed PMID: 26684761.