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LETTER TO THE EDITOR

Berrin Erok , Hakan Önder

Contiguous diploic veins and ıntraosseous arachnoid granulations: can they function more than necessary?

Department of Radiology, University of Health Sciences Prof Dr Cemil Tascıoglu City Hospital, Istanbul, Turkey

Dear Editor,

Cerebrospinal fluid (CSF) is produced within the ventricular system by the choroid plexus and flows from the lateral ventricles to the third and then fourth ventricle and eventually reaches the subarachnoid space around the brain and spinal cord. Then the majority of CSF is reabsorbed from the subarachnoid space into the venous system by the arachnoid granulations (AGs), which are projections of the arachnoid membrane into the dural venous sinuses, particularly the superior sagittal sinus and the transverse sinuses. Up to 15% of these AGs are also found within the perineural spaces of the cranial and spianal nerve sheaths to provide CSF drainage into the lymphatics.[1]

Additionally, diploic veins (DVs) which are present throughout the cranium and provide an important connection between the extracranial and intracranial venous systems was previously suggested as an alternative drainage pathway for intracranial CSF via communication with intraosseous projections of AGs.[2,3] What if these contiguous diploic veins make any sense when they are dilated? Adjacent dural venous sinuses are expected to be atretic. Can they also cause excessive CSF reabsorption? We thinkt that, the contiguous dilated DVs in relation with intraosseous AGs may not only offer a simple alternative pathway, but may also cause an undesirable rate of CSF reabsorption which may result in compansatory CSF overproduction and ultimately a communicative hydrocephalus. We examined this probability on neuroimaging studies of a 77-year old female patient presented with recently started decline in cognitive functions (dementia) and ataxic gait. Brain magnetic resonance imaging (MRI) findings included ventriculomegaly with Evan's index of 0.38 and transependymal edema in addition to disproportionate changes in subarachnoid spaces characterized with minimal cortical atrophy with narrow convexity-parafalcine sulci in contrast to dilated sylvian fissures compatible with hydrocephalus in addition to moderate age related cerebral atrophy (Fig. 1).[4,5]

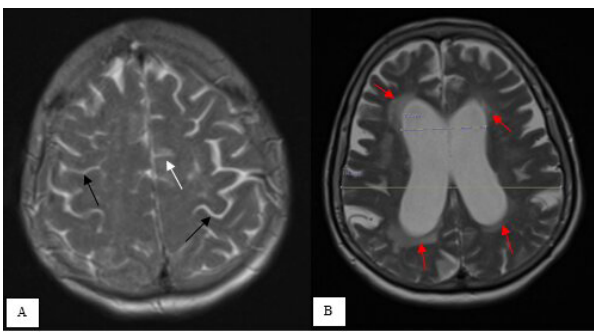

Fig. 1. The brain axial T2w MRI showing disproportionate changes in the subarachnoid spaec. The relatively narrow convexity (A, black arrows) and parafalcine (A, white arrow) sulci in contrast to more prominent ventriculomegaly with Evan' index of 0,38 (50/130) and associated transependymal edema (B, red arrows)

In addition, on the head computed tomography (CT) performed two days previously when she pre-

Corresponding author: Berrin Erok, e-mail: drberrinerok@hotmail.com

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sented to the emergency department with similar complaints, intraosseous AGs in the right side of the occipital bone and dilated diploic veins throughout the cranium but more prominent on the right side were noted. As expected, the right sided sigmoid sinus and the jugular bulb were atretic (Fig. 2).

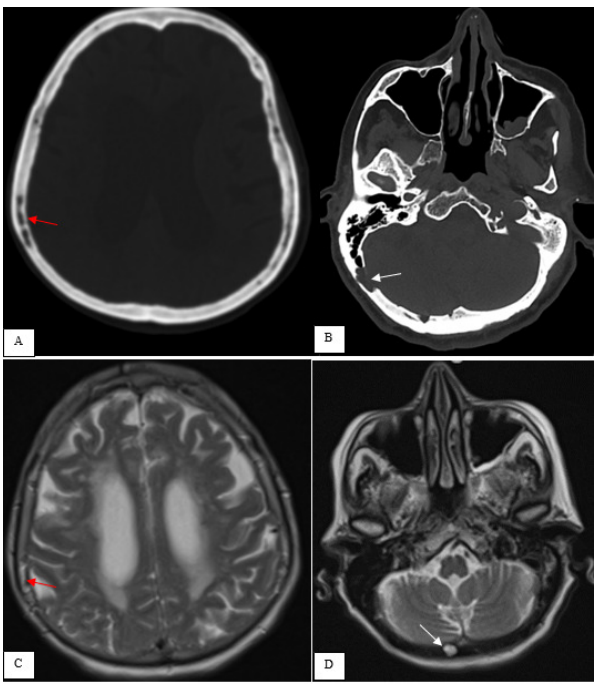

Fig. 2. Head CT scan axial images Show the right sided atretic sigmoid sinüs (A, red arrow) and judular bulb (B, white arrow). Compare these with the normal sized left sigmoid sinüs (C, red arrow) and jugular bulb (C, white arrow)

Hyperintensity compatible with CSF signal within these dilated varicose DVs was suggestive of CSF reabsorption via intraosseous AGs (Fig. 3).

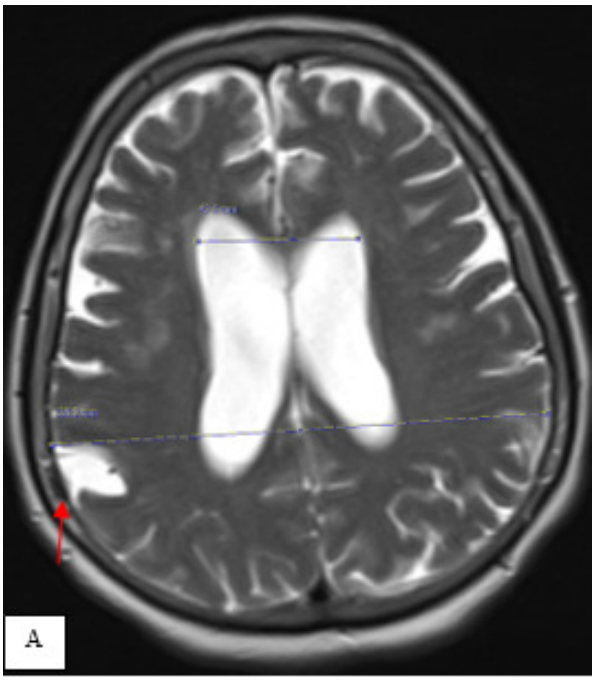

Fig. 3. (A, B) Axial Bone window images of the head CT demonstrating dilated diploic veins throughout the cranium, more prominent at the right side (A, red arrow). An intraosseous AG is shown (B, white arrows).C,D) Axial T2w MRI showing the CSF signal intensity within the same DV (C, red arrow) and another intraosseous AG projecting into the occipital bone with characteristic CSF signal on T2w images (D, white arrow)

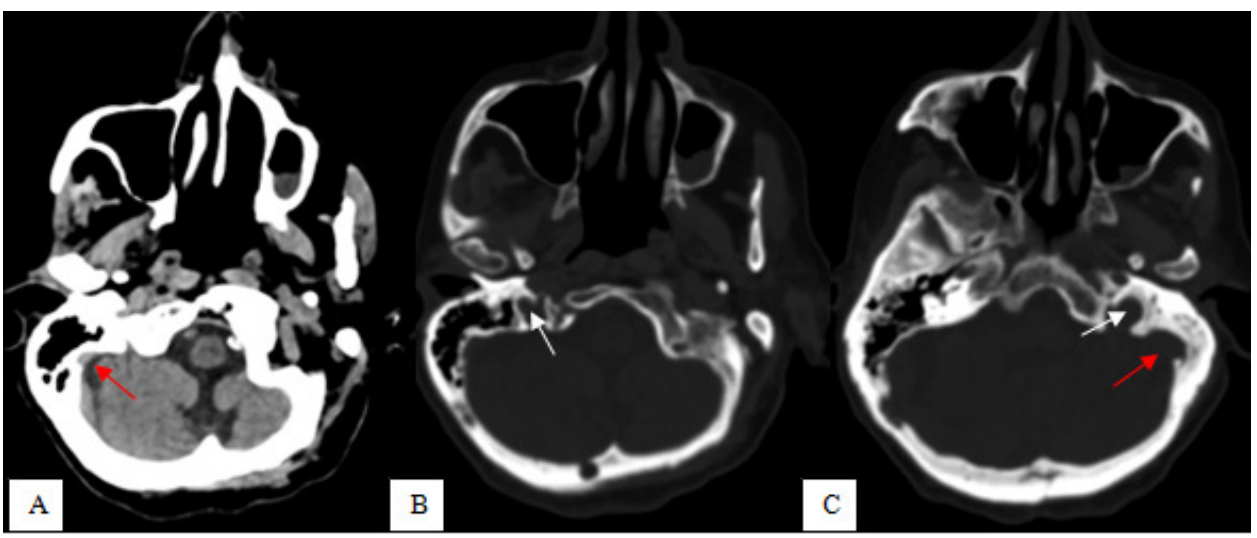

Fig. 4. Axial T2w MR image performed 5 years ago at the same level with figure 1B showing less ventriculomegaly (Evan's index of 0.30) without transependymal edema, compatible with age related dilatation of the ventricular system. Please note the absence of CSF signal witihin the same DV as shown in figüre 2C. Instead of CSF signal flow void is present (red arrow)

After examining the patient's previous neuroimaging studies, we realized that three years ago while the hydrocephalus (Evan's index of 0.32) was not so obvious, the signal intensity of the DVs was not the same as CSF, on the contrary, there was a flow void on T2w images (Fig. 4). As in our patient, overfunctioning of dilated DVs in association with intraosseous AGs may be the underlying cause for development of normal pressure hydrocephalus (NPH).

Declarations

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Author contributions
Conceptualization, B.E. and H.O.; Methodology, B.E.; Formal Analysis, B.E. and H.O.; Investigation, B.E.; Writing – Original Draft Preparation, B.E.; Writing – Review & Editing, H.O.

Conflicts of interest
The authors declare no conflict of interest.

Data availability
All data generated or analyzed during this study are included in this article [and/or] its supplementary material files. Further enquiries can be directed to the corresponding author.

Ethics approval
Informed consent was taken from the patients.

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