Conservative and Surgical Treatment of Patients with Pineal Cysts: Prospective Case Series of 110 Patients

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BACKGROUND: **A pineal cyst is a relatively common benign condition of the pineal gland. The clinical management of patients with a pineal cyst remains controversial, especially when patients present with nonspecific symptoms.**

METHODS: **We performed a prospective study between 2000 and 2016. All patients with a pineal cyst >7 mm were included. Epidemiologic data, presenting symptoms, surgical results, and radiographic and clinical follow-up were documented.**

RESULTS: **A total of 110 patients were enrolled in the present study. The most common presenting symptoms were tension headache (62.7%), vertigo (16.4%), migraine (12.7%), syncope (10.9%), nausea (8.2%), and diplopia (8.2%). Symptoms worsened during the follow-up period in 17 patients (15.5%), improved in 13 patients (11.8%), and remained stable in 81 patients (73.6%). The mean follow-up was 79.2 months. A pineal cyst increased in size during the follow-up in 6 patients (5.5%) and decreased in size in 9 patients (8.2%). Twenty-one patients underwent pineal cyst resection; 20 patients (95.2%) reported some improvement in their presenting symptoms, and 10 patients (47.6%) were symptom free after the surgery.**

CONCLUSION: **We present the largest clinical series of patients with pineal cysts. Surgery, if indicated properly, is a legitimate treatment modality for symptomatic patients with satisfactory results. Relief of symptoms, even nonspecific ones, is achieved in the majority of cases. Simple growth of the cyst in the first decades of life is a part of the natural course and should not be considered as an indication for surgery.**

INTRODUCTION

A pineal cyst (PC) is a cystic transformation of the pineal gland with a prevalence of 0.7%–1.5% in the general population. A natural course of PC is usually benign. Magnetic resonance (MR) studies show a peak incidence in children 10–14 years of age followed by a slow involution later in life. A female preponderance is reported in all large studies.[1-4]

In most cases PC is an incidental finding on brain imaging studies with no clinical correlate, and it usually needs no active treatment. Sometimes, PC is attributed to vague, nonspecific symptoms, such as headache, sleep disturbances, and fatigue. In some patients, PC might exert a mass effect on surrounding structures and cause Parinaud syndrome or hydrocephalus.

Although PC is a common condition, clinical management of patients with PC remains dubious and guidelines for treatment and follow-up are lacking.[5] Most neurosurgeons agree that patients presenting with hydrocephalus and Parinaud syndrome are strong candidates for surgical treatment. Operating on patients with nonspecific symptoms is highly controversial, and most neurosurgeons will not operate on them.[6-8] However, some surgeons operate on these patients and report promising results. Most of these reports are either clinical cases or retrospective cohorts.[9-14] No prospective randomized trial has been conducted to date to demonstrate the effect of surgery for patients with nonspecific symptoms.

Key words
- Conservative treatment
- Headache
- Natural history
- Neurosurgery
- Pineal cyst
- Pineal gland
- Magnetic resonance imaging

Abbreviations and Acronyms
CCOS: Chicago Chiari Outcome Score
MR: Magnetic resonance
PC: Pineal cyst

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In this prospective cohort, we report our experience with the treatment of patients harboring PC. We describe the presenting symptoms, medical treatment, and surgical results. We focus on the natural course of the disease and discuss indications for surgery.

MATERIALS AND METHODS

Patients and Clinical Evaluation

We enrolled all patients with PC who were referred to our department between 2000 and 2016. Each patient underwent a detailed clinical examination; the patient age, sex, and presenting signs and symptoms were noted. We focused on a subtype of headache (tension headache, migraine, and cluster headache); sleep disturbances; and affective disorders (depression). Periodic examination was performed on an annual basis, and a clinical course was reassessed.

From 2012, we included in the study protocol standardized and validated questionnaires. We assessed sleep disturbances using the Pittsburgh Sleep Quality Index[15] and Epworth Sleepiness Scale.[16] Possible depression was measured using Beck Depression Inventory II.[17] To determine headache influence on everyday life, Headache Impact Test 6[18] and Migraine Disability Assessment score[19] were performed.

Radiographic Evaluation

PC was defined as a smooth-walled cystic lesion in the pineal region and rim enhancement after gadolinium not thicker than 2 mm on MR imaging. The size of the PC was measured as the largest diameter on a sagittal T2-weighted image. A lower cut-off value for size was 7 mm. A multilobular or homogeneous structure of the PC was noted. Serial high-field MR (3 T) scans with gadolinium enhancement were acquired annually in every patient during the follow-up (see Figure 1).

Surgical Treatment

An indication for surgery was made on a strictly individual basis after an extensive examination, serial MR scanning, and discussion with the patient. Clear indication was the presence of hydrocephalus or Parinaud syndrome. Severe tension headache, vertigo, diplopia, and syncope were considered as a relative indication. Only the patients with intractable or progressive nonspecific symptoms were offered surgical treatment after ruling out other possible causes.

In all cases, we used the microscopic supracerebellar infratentorial approach in a sitting position. All surgeries were performed by the senior author (V.B.). Every histologic specimen was examined by a neuropathologist, and the diagnosis of PC was confirmed.

All surgical complications were noted, including cerebrospinal fluid leak, postoperative hematoma, wound infection, and new neurologic deficit. The clinical outcome was measured using composite Chicago Chiari Outcome Score (CCOS, see Table 1 for details).[20] The CCOS is a standardized, validated[21] tool for evaluating clinical outcomes in patients after surgery for Chiari malformation I. This established scoring system was chosen for better reproducibility of our results. Chiari malformation I has some similarities with symptomatic PCs that justify the use of CCOS in patients with PC. These similarities include the clinical presentation (headache, vertigo, and unsteadiness); natural course (usually stable for years); and surgical treatment (major posterior fossa surgery). CCOS evaluates the surgical outcome in 4 categories, including pain symptoms, nonpain symptoms, functionality, and complications, with a minimal possible score of 4 (worst outcome) and maximum possible score of 16 (best outcome).

Statistical Analysis

Comparison of continuous variables was done using the 2-tailed unequal variance Student's *t*-test. $P = 0.05$ was taken as the

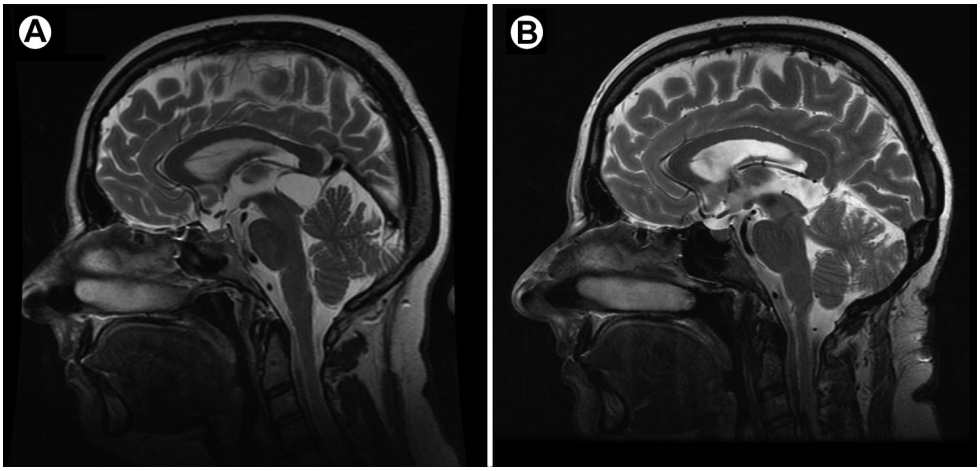

Figure 1. Sagittal T2-weighted magnetic resonance scan of patient with a pineal cyst before (**A**) and after a cyst resection (**B**).