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Report 2013: Tumors of the pineal region

## The sub-occipital transtentorial approach revisited base on our own experience

### *L'approche sous-occipitale transtentorielle analysée d'après notre propre expérience*

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#### ABSTRACT

The surgical experience of the sub-occipital approach for treatment of pineal gland and pineal region tumors is reported. This approach was originally proposed by Jamieson and modified by Lapras who by changing the shape of the bone flap obtained the elevation of the occipital lobe which consequently resulted in a better exposition of this deep region. The reason why this approach became the basis for their treatment is particularly related to the personal experience of Lapras who reported his fantastic experience of surgery in this deep area and demonstrated the advantages of the sub-occipital transtentorial approach.

**Material.** – Out of 277 patients operated from 1982 to 2012 in Lyon for a pineal tumor, 233 were treated by a sub-occipital approach: 153 males, 125 females, 75 patients of pediatric age. The majority of patients were operated on in a sitting position which represents a surgical specialty of the anesthesiological school of Lyon.

**Results.** – Complete tumor removal was possible in 135 patients (58%) and partial in 60 patients (26%). For 38 patients, it was not possible to establish the quality of surgical resection. The incidence of hemianopsia decreased to less than 2% of cases while the incidence of severe pneumocephaly which requires a prolonged intensive care hospitalization was less than 4% of cases. Mortality related to this surgical approach in the Lyonnais school series was 0% during this period.

**Conclusion.** – In our experience the sub-occipital transtentorial approach seems to us the best approach for pineal tumors because it permits a large exposition of the pineal region favoring the removal of the tumor with a lateral extension and also for tumors extending low into the posterior cranial fossa. In fact, this is our preferred approach because it has been used in a large majority of cases. However, surgeons have to be familiar with other possible approaches to obtain the best result in terms of removal and also to decrease the rate of sequelae to improve the quality of life of these patients.

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#### R É S U M É

L'expérience chirurgicale de l'approche sous-occipitale transtentorielle pour le traitement des tumeurs de la pinéale et de la région de la pinéale est décrit. Cet abord avait été proposé par Jamieson et modifié par Lapras qui avait changé la forme du volet pour favoriser l'élévation du lobe occipital en améliorant l'exposition de cette région. Cette approche est devenue l'abord d'élection dans l'expérience lyonnaise grâce à l'expérience chirurgicale de Lapras qui a montré ses avantages.

**Matériel.** – Parmi 277 patients opérés entre 1982 à 2012 pour une tumeur de la pinéale, 233 ont été traités par un abord sous-occipital transtentorial (153 hommes et 125 femmes, 65 patients en âge pédiatrique). La majeure partie des patients ont été opérés en position assise qui représente une spécialité de l'école d'anesthésie de Lyon.

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**Résultats.** – L'exérèse complète a été possible chez 135 patients (58 %) et partielle pour 60 patients (26 %). Pour 38 patients, il n'a pas été possible d'établir la qualité de l'exérèse. L'incidence d'hémianopsie est diminuée à moins de 2 % et l'incidence de pneumocéphalie sévère nécessitant une hospitalisation dans un service de thérapie intensive a été de moins de 4 %. La mortalité en relation à l'abord chirurgical pendant cette période a été de 0 %.

**Conclusion.** – Dans notre expérience, l'abord sous-occipital transtentorielle pour le traitement des tumeurs de la pinéale permet une large vue de la région avec la possibilité de contrôler une extension latérale et dans la fosse postérieure. Nous sommes d'accord que, bien que cette approche soit utilisée dans la majeure partie des cas de notre série, le chirurgien doit savoir maîtriser les autres alternatives chirurgicales pour avoir le meilleur résultat oncologique et réduire l'incidence des séquelles en améliorant la qualité de vie des patients.

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## 1. Introduction

The direct approach to pineal region tumors is a difficult challenge for surgeons [1–4].

Different approaches have been described but all are related to the tentorial plane and consequently they can be divided into supratentorial or infratentorial routes which have been performed for some time and frequently discussed. The choice mainly depends on the surgical experience of individual surgeons [5].

In Lyon, we are more familiar with the sub-occipital transtentorial approach that has been more frequently used than the infratentorial approach. This choice is motivated by several major advantages as described by Lapras [6]: a shorter route than the other; better visual control of the venous arch represented by the basilar veins and the vein of Galen and, in particular, a better control of both internal cerebral veins that are generally located behind the pineal tumors, sometimes elevated but rarely enclosed by the tumor.

## 2. History of the sub-occipital transtentorial approach

The narrow access to the pineal region prompted by Heppner [7], as reported by Pendl [2,3], using the suboccipital transtentorial approach in 1959.

Theoretically, this approach was originally reported by Tandler and Ranzi in 1920 [8].

The variation suggested by Poppen with the opening of the tentorium was proposed in 1966 and with the opening of the tentorium, it was possible to provide more space to approach the lesion in this deep area [9].

Many other surgeons have used this approach such as Negrin [10], Glauser [11], Lazar and Clark [12], and then Jamieson [13] who supported the advantages of using a lateral position.

Lapras had revisited the occipital transtentorial approach by introducing modifications in order to facilitate a better exposition of the pineal region, with the aim of obtaining better control of the surgical field by increasing the rate of complete removal and decreasing the rate of surgical sequelae [6,14].

The surgical position used in a large majority of cases has been the sitting position.

We describe the approach as performed in Lyon stressing the fact that this approach is not an interhemispheric occipital approach but rather a sub-occipital approach favoring, in our opinion, a better visualization of the pineal region. This widens the space for surgeons that can be used for dissection, in cases of a lateral extension or in case of an inferior extension under the plane of the tentorium, as well as in the posterior fossa reducing the lateral retraction of the cerebral hemisphere.

The main advantage of the suboccipital transtentorial approach is the large exposure of midline and paramedian lesions extending to the posterior incisural space, the dorso lateral space of the brainstem and also permitting a large exposure of the anatomical

structures located above the plane of the tentorium and the venous system i.e. the lateral ventricle, the posterior thalamus, the medial temporal lobe, the *splenium* and the *corpus callosum* [6,14,15].

## 3. Position

We do not use lumbar drainage as suggested by some authors in the literature because if the patient presents signs of intracranial hypertension due to hydrocephalus, we start by treating the hydrocephaly and perform a direct approach after 48 hours.

In recent years, we have recommended a ventriculostomy that also permits a biopsy.

As previously mentioned, this approach is generally performed in the sitting position.

The advantages of the sitting position have been widely discussed in literature but it is true that the sitting position requires an experienced anesthesiologists in order to reduce the risks of anesthesiological complications that are generally represented by air embolism complications and occurrence of pneumocephalus that requires intensive medical treatment to reduce the patient's discomfort and facilitate the rapid absorption of air [16] (Figs. 1 and 2).

In the sitting position, the hips have to be positioned against the operating table, the lower arm must be flexed and elevated at the level of the heart, being careful to avoid an elongation of the sciatic nerve that could be responsible, sometimes, for post-operative sciatica.

The operating table is inclined at 90° to assure the correct position of the patient.

The headrest is mandatory for good positioning of the head and generally a single pin of the Mayfield headrest is positioned at the level of the frontal region on the side of the approach, while the other two pins of the headrest are positioned on the contralateral side.

We avoid using the headrest for children who are less than three years of age to prevent complications related to the fragility of the skull at this age.

When the approach is performed on the right side the head is rotated 45° to the right and tilted downward by at least 15°. The operating table is rotated forward in order to have the plane of the tentorium parallel to the floor of the operating room. This position makes the opening of the tentorial plane easier.

The use of navigation is very useful to facilitate the localization of the venous sinus when a bone flap is performed and also, when the dura mater is opened, to localize the deep venous structures, the lateral wall of the third ventricle or the position of the floor in some major lesions.

## 4. Scalp incision

The sub-occipital transtentorial procedure necessitates, in our opinion, a wide approach. For years, we have tried to reduce the

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