Mechanical characterization of skull base tumors

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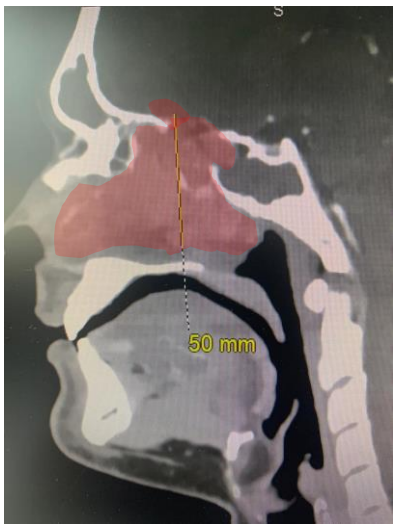


Sagittal CT scan of a tumor of the anterior skull base (in red) which invades the frontal lobe. It can be removed by endoscopic endonasal approach.

View of a surgical team performing endoscopic endonasal skull base tumor resection

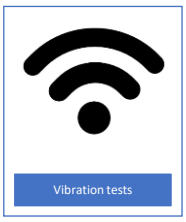
Context

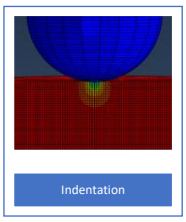
Skull base tumors are located at the interface between the brain, the orbits and the nasal cavity and can be removed using minimally invasive approach through the nasal cavities. **Surgical dissection** is required to separate nerves and arteries from the tumor and avoid surgical complications. This type of surgery, through the natural nasal pathway, does not allow the entire tumor to be removed in one piece (monobloc excision). The tumor must therefore be broken up and resected step by step (size of **fragments**: cubic centimeters)[1].

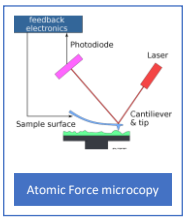
The consistency of these tumors is difficult to predict. The softer the tumor, the easier it is to remove through endonasal endoscopic approach[2]. In some cases, when the tumor is too rigid, endoscopic extraction is impossible without damaging the surrounding structures. **Mechanical characterization of these tumors**, coupled with preoperative imaging data, is therefore of interest in **predicting the difficulty** of endonasal tumor **extraction**.

Research topic

1. **A literature review of mechanical tumor characterization methods will be carried out to determine the options of mechanical testing.**
2. **On the basis of this review and considering the need to test only tumor fragments, a mechanical test bench will be proposed and tested.**
3. **Micro-MRI morphological analysis of samples could be performed to predict tumor consistency preoperative on imaging.**







Perspectives

The mechanical characterization of tumors will have a direct impact on patient management and the choice of surgical technique. These data will also be used to design surgical robots and medical devices

References

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2. Zada G, Yashar P, Robison A, Winer J, Khalessi A, Mack WJ, et al. A proposed grading system for standardizing tumor consistency of intracranial meningiomas. Neurosurg Focus. 2013 Dec;35(6):E1.

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