

ОРИГИНАЛЬНЫЕ СТАТЬИ

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SURGICAL ANATOMY OF PITUITARY MICROADENOMAS

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Objectives. Establishing surgical variants of pituitary microadenoma anatomy, singling out basic technical issues that arise during their removal, considering various approaches to handling pituitary microadenomas depending on their localization.

Methods. The research material is represented by 66 pituitary microadenoma patients, 50 cases being females (76%), and 16 cases being males (24%). The average age of the patients was 33.5 years. The research involves adrenocorticotropin-, somatotropin-, thyrotropine-producing pituitary tumors, prolactin-producing adenomas and incidentalomas.

Results. We singled out the following varieties of pituitary microadenoma surgical anatomy: anterolateral version (I), lower lateral version (II), and dorsal version (III).

Conclusion. We believe that the suggested topographic-anatomical versions of pituitary microadenomas also correspond to the gradation of surgical complexity ranging from I to III. This gradation also helps predict surgical issues associated with each specific case and adequately assess the volume of the planned surgical invasion. Variant III is the most complicated one.

Key words: pituitary adenoma, pituitary microadenoma, diagnosis, treatment, surgical anatomy, dura mater, microsurgical removal, endoscopic assistance, cavernous sinus, tumor invasion

Introduction

Pituitary adenomas (PA) are fairly common benign intracranial tumor pathology. They appear from anterior part of pituitary and are intradural, but extraarachnoidal lesions. This fact is important for understanding of microadenoma topographic anatomy [1,2,3]. In addition, arising from adenohypophysis cells, microadenomas form around itself pseudocapsule that resembles the arachnoid membrane [5,6]. It might be good expressed, that facilitates dissection (separation of it along with the tumor tissue from normal pituitary), and might be completely absent. [7] Such invasiveness of pituitary adenoma on the stage of microformations can be shown as cavernous sinus (CS), diaphragm sella, or pituitary stalk invasion, which significantly affects the safety and efficacy of surgical intervention [8,9].

Background: to define different surgical types of pituitary microadenomas anatomy, to assess the main technical difficulties, which present during tumor removal, to research different types of approaches to microadenomas due to those localization.

Materials and methods. Our data is based on the material of observation of 66 patients, operated in the Institute of Neurosurgery over a period 2010-2012. Females were 50 cases (76%) and males were 16 (24%), that ratio was approximately 3:1. The main age was 33,5 years. Our investigation includes ACTH-secreting, GH-secreting, TTH-secreting, PRL-secreting pituitary microadenomas (with cystic tumors and prolactinomas resisted to dopamine agonist therapy) and incidentalomas. (Tab.1.)

Table 1.

Distribution of microadenomas clinical groups

Tumor's type	Total number of cases (%)	Females	Males
ACTH-secreting	35 (53%)	28 (80%)	7 (20%)
GH-secreting	6 (9%)	2 (33%)	4 (67%)
TTH-secreting	3 (5%)	3 (100%)	0 (0%)
PRL-secreting cystic tumors	4 (6%)	4 (100%)	0 (0%)

PRL-secreting tumors resisted to dopamine agonist therapy	6 (9%)	6 (100%)	0 (0%)
Incidentalomas	12 (18%)	7 (58%)	5 (42%)

All our patients underwent head MRI: 40 (60,6%) - native, 26 (39,4%) - with gadolinium contrast). In all cases microadenomas were removed microsurgically by transnasal-transsphenoidal approach. In 21 cases we used endoscopic assistance with 0°, 30°, 45° angle inspection. 6 patient with solid type of prolactinomas have been treated for 6-14 month with dofamin agonists (parlodel, cabergolin), but this treatment wasn't successful.

After comparison of all prior surgery data, and observations obtained during surgery we identified different types of pituitary microadenomas surgical anatomy.

Results

Due to our investigation we found out next types of pituitary microadenomas surgical anatomy (Fig. 1):

1. I - anterior-lateral type
2. II - inferior-lateral type
3. III - posterior type (including ectopic tumors in pituitary stalk)

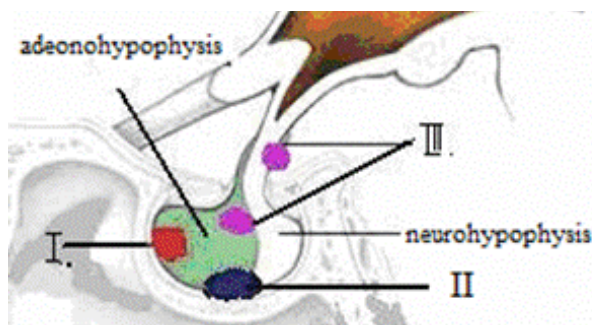


Fig. 1.
Topographo-anatomical types of pituitary microadenomas

During removal of anterior-lateral type (Fig. 2.) of microadenomas after dura mater incision tumor's tissue usually was "born by itself", because of soft glandular structure. This microadenomas are very good for aspiration and don't need a long removal by curette. Surgical difficulties with this type of microadenomas localization occur in the case of cavernous sinus tumor invasion (it is particularly often observed for ACTH - and GH - secreting adenomas, even on the stage of microformations!) and also in case with unexpressed tumor's pseudocapsule, which is difficult to remove (in these cases, its remains can be coagulated). To improve the volume of PA resection, when cavernous sinus invasion was present, we used 45° endoscope. Anterior-lateral localization of microadenomas, in general, is most common for PRL-secreting tumor's and incidentalomas.

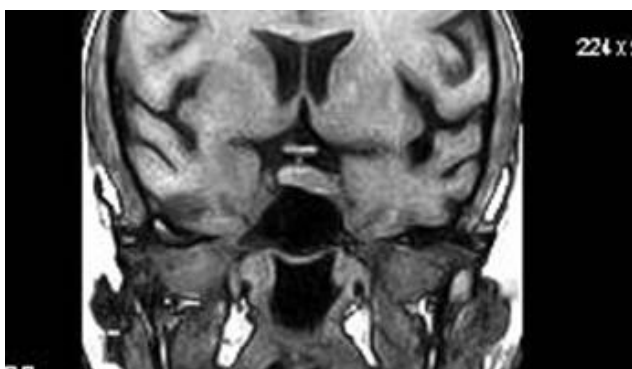


Fig. 2.

Head MRI of 27-years old female patient with anterior-lateral type of microadenoma with right CS invasion.

In case with inferior-lateral type of microadenoma localization it is absolutely necessary to coagulate and cut inferior intercavernous sinus before opening the dura mater to avoid serious bleeding because of its injury. With this type of tumor's anatomy we can't see the all microadenoma tissue at once after opening dura flap, because it is covered by anterior pituitary lobe. We used 30° endoscope to improve surgical review and to increase radical tumor's removal. Inferior-lateral type of tumor's localization is most common for GH-secreting microadenomas, ACTH-secreting microadenomas and incidentalomas.

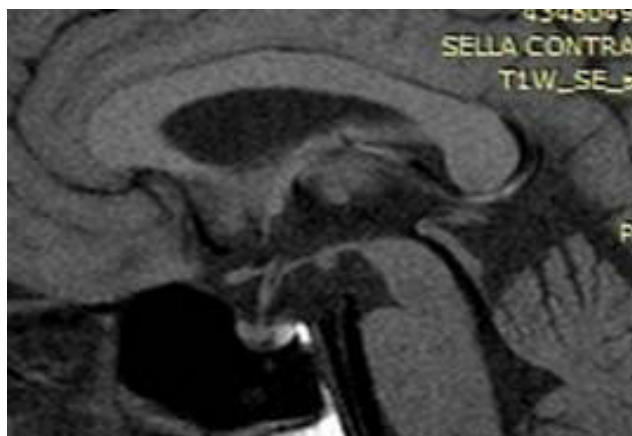


Fig. 3.

Head MRI of 30-years old female patient with inferior-lateral type of microadenoma

Posterior type of microadenoma localization is the most difficult for surgical treatment because all tumor tissue is covered with pituitary (Fig. 4). In the process of removal of this tumor type it was impossible to visualize PA with endoscope assistance, even after wide bone window formation (direct to the dorsum sella) and wide dura mater incision. In this case it is necessary to cut pituitary gland and to separate its edges sideways to look for a tumor. Tumor lateralization detected earlier by head MRT can be the marking point. Otherwise, sometimes it is necessary to make few lateral cuts in different parts of adenohypophysis. The distinction of microadenomas of a rear kind is their frequently diagnosed invasion of diaphragm sella and pituitary stalk, which, in its turn, is connected to high risk of postoperative CSF leak and diabetes insipidus. However, considering a special aggressiveness of hormone-secreting PA, which especially recur with corticotropinomas, in case when no clear borders between microadenoma and pituitary tissue are visible, the most possible radical surgery is indicated - removal of all anterior pituitary lobe. In our practice this group of tumors also includes so called ectopic PA, originating from stalk area and growing over diaphragm sella (most frequently it relates to ACTH-secreting tumors). In this case microadenoma removal with excision of pituitary stalk involved in the process is justified. This is followed by antidiuretic hormone replacement therapy.

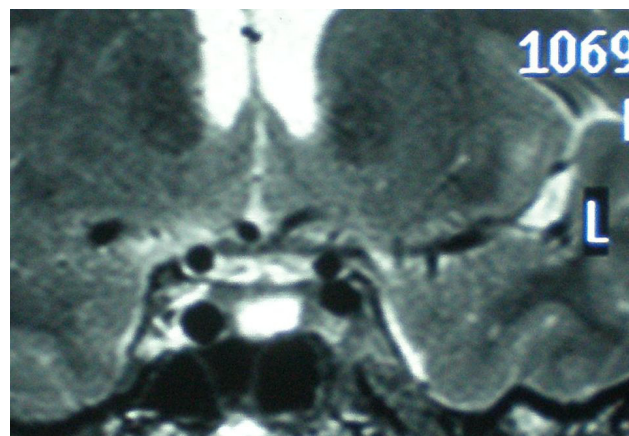
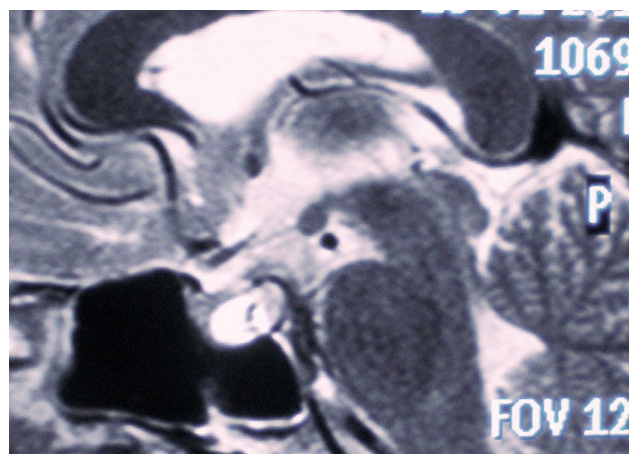
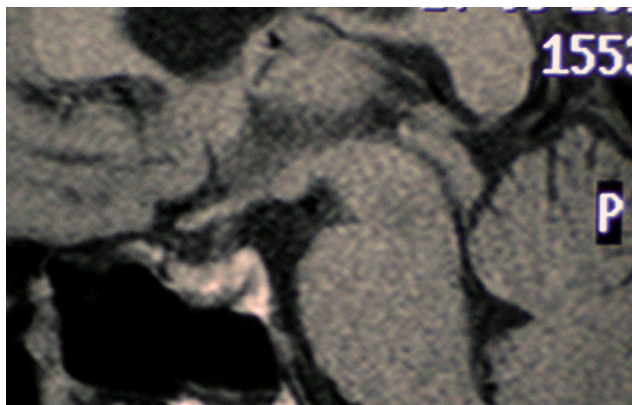


Fig. 4.

Head MRI of 34-years old male patient with posterior type of microadenoma (before and after surgery)



Distributing of microadenomas depending on the indicated anatomic types is presented in a table 2

Table 2.

Tumor's type	Anterior-lateral type	Inferior - lateral type	Posterior type
ACTH-secreting	20	3	12
GH-secreting	1	3	2
TTH-secreting	1	0	2
PRL-secreting	8	2	0
Incidentalomas	7	4	1

Conducting the analysis of our patient surgical treatment results (only early postoperative period was analyzed for the moment) we found out the followings features:

1. The best results of surgical treatment were observed in case of anterior-lateral type of tumor's localization. We also marked increasing of radical tumor removal from cavernous sinus wall using 45° endoscope compare with full microsurgical removal.

2. Transient oculomotor nerves disorders appeared more often after removal of inferior-lateral type of microadenoma (2 patients). We always coagulated widely inferior intracavernous sinus before opening dura mater, but bleeding started again in 50% of the cases during tumor removal because of intrasellar high blood pressure. This can increase duration of the operation. We did avoid injured of normal pituitary tissue using 30° endoscope, cause it gave us a possibility to remove tumor from under hypophysis.

3. The most amount of postoperative CSF leak (2 cases) and transient polyuria (3 cases) were observed in case of posterior type of pituitary microadenomas localization, which was more common for more aggressive tumors (ACTH-secreting, GH-secreting and TTH-secreting PA). 2 patients from this group were reoperated during 7 days after the first surgery, because of the absence of clinic and laboratory remission (ACTH-secreting tumors involved the pituitary stalk).

1. We think that proposed topographic-anatomical types of pituitary microadenomas could be also a grade of surgical difficulties from I to III.

2. This grade helps to prognose surgical difficulties in every unique case and to evaluate the volume of operative treatment.

3. Type III is not only the most complex for surgical removal but is also the most dangerous because of the possibility of pituitary stalk injure and postoperative CSF leak appearance.

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ТҮЙІНДЕМЕ

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ГИПОФИЗ МИКРОАДЕНОМАСЫНЫҢ ХИРУРГИЯЛЫҚ АНАТОМИЯСЫ

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Зерттеудің мақсаты: гипофиз микроаденомаларының анатомиясын хирургиялық нұсқаларын анықтау, оларды алып тастауда кезінде пайда болатын негізгі техникалық қиыншылықтарды атап кету, орналасқан жеріне қатысты гипофиз микроаденомдарына арналған әртүрлі тәсілдердің нұсқаларын қарастыру.

Әдістері. Гипофиз микроаденомалары бар 66 пациент материал болып табылды. Әйел адамдар - 50 бақылау (76%), ер адамдар - 16 (24%). Пациенттердің орташа жасы 33,5 жасты құрайды. Зерттеуге АКТГ (адренокортикотропты гормон)-секреторлық, СТГ (соматотропты гормон) –секреторлық, ТТГ (тиреотропты гормон)– гипофиз ісіктерін секрециялау, пролактин – аденомалар мен инциденталомаларды секрециялау.

Нәтижесі. Біз гипофиз микроаденомаларының хирургиялық анатомиясының мынадай нұсқаларын

атап кету жөн деп таптық: алдыңғы-латералдық нұсқа (I), төменгі латералдық нұсқа (II), артқы нұсқасы (III).

Қорытындысы. Біз ұсынылып отырған гипофизаденомаларының топографты-анатомиялық-нұсқалары I-ден III-ке дейін бірауқытта және хирургиялық қиындықтардың градациясымен деп санаймыз. Бұл нұсқаға бөлу әрбір нақты жағдайдың хирургиялық қиындықтарын білуге және жоспарланып отырған хирургиялық араласудың көлемін дәл бағалауға көмектеседі. III-нұсқа ең қиын болып табылады.

Негізгі сөздер: гипофизаденомасы (ГА), гипофизмикроаденомасы, диагностикалау, емдеу, хирургиялық анатомия, мидың қатты қабығы (МКҚ), микрохирургиялық алып тастау, эндоскопиялық-ассистенция, үңгірлі синус (УС), ісік инвазиясы.

РЕЗЮМЕ

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ХИРУРГИЧЕСКАЯ АНАТОМИЯ МИКРОАДЕНОМ ГИПОФИЗА

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Цель исследования: определить хирургические варианты анатомии микроаденом гипофиза, выделить основные технические сложности, которые возникают при их удалении, рассмотреть различные варианты подходов к микроаденомам гипофиза в зависимости от их локализации.

Методы. Материалом являются 66 пациентов с микроаденомами гипофиза. Женщин - 50 наблюдений (76%), мужчин 16 (24%). Средний возраст пациентов составил 33,5 лет. В исследование включены АКТГ-секретирующие, СТГ–секретирующие, ТТГ-секретирующие опухоли гипофиза, пролактин-секретирующие аденомы и инциденталомы.

Результаты. Мы выделили целесообразным выделить следующие варианты хирургической анатомии микроаденом гипофиза: передне-латераль-

ный вариант (I), нижнелатеральный вариант (II), задний вариант (III).

Заключение. Мы считаем предложенные топографо-анатомические варианты микроаденом гипофиза одновременно и градацией хирургической сложности от I до III. Это распределение помогает предугадать хирургические сложности каждого конкретного случая и адекватно оценивать объем планируемого оперативного вмешательства. Вариант III является наиболее сложным.

Ключевые слова: аденома гипофиза (АГ), микроаденома гипофиза, диагностика, лечение, хирургическая анатомия, твердая мозговая оболочка (ТМО), микрохирургическое удаление, эндоскопическая ассистенция, кавернозный синус (КС), инвазия опухоли.