= Pituitary apoplexy =

Pituitary apoplexy or pituitary tumor apoplexy is bleeding into or impaired blood supply of the pituitary gland at the base of the brain . This usually occurs in the presence of a tumor of the pituitary , although in 80 % of cases this has not been diagnosed previously . The most common initial symptom is a sudden headache , often associated with a rapidly worsening visual field defect or double vision caused by compression of nerves surrounding the gland . This is followed in many cases by acute symptoms caused by lack of secretion of essential hormones , predominantly adrenal insufficiency .

The diagnosis is achieved with magnetic resonance imaging and blood tests . Treatment is by the timely correction of hormone deficiencies , and in many cases surgical decompression is required . Many people who have had a pituitary apoplexy develop pituitary hormone deficiencies and require long @-@ term hormone supplementation . The first case of the disease was recorded in 1898 .

= = Signs and symptoms = =

= = = Acute symptoms = = =

The initial symptoms of pituitary apoplexy are related to the increased pressure in and around the pituitary gland . The most common symptom , in over 95 % of cases , is a sudden @-@ onset headache located behind the eyes or around the temples . It is often associated with nausea and vomiting . Occasionally , the presence of blood leads to irritation of the lining of the brain , which may cause neck rigidity and intolerance to bright light , as well as a decreased level of consciousness . This occurs in 24 % of cases .

Pressure on the part of the optic nerve known as the chiasm , which is located above the gland , leads to loss of vision on the outer side of the visual field on both sides , as this corresponds to areas on the retinas supplied by these parts of the optic nerve ; it is encountered in 75 % of cases . Visual acuity is reduced in half , and over 60 % have a visual field defect . The visual loss depends on which part of the nerve is affected . If the part of the nerve between the eye and the chiasm is compressed , the result is vision loss in one eye . If the part after the chiasm is affected , visual loss on one side of the visual field occurs .

Adjacent to the pituitary lies a part of the skull base known as the cavernous sinus . This contains a number of nerves that control the eye muscles . 70 % of people with pituitary apoplexy experience double vision due to compression of one of the nerves . In half of these cases , the oculomotor nerve (the third cranial nerve) , which controls a number of eye muscles , is affected . This leads to diagonal double vision and a dilated pupil . The fourth (trochlear) and sixth (abducens) cranial nerves are located in the same compartment and can cause diagonal or horizontal double vision , respectively . The oculomotor nerve is predominantly affected as it lies closest to the pituitary . The cavernous sinus also contains the carotid artery , which supplies blood to the brain ; occasionally , compression of the artery can lead to one @-@ sided weakness and other symptoms of stroke .

= = = Endocrine dysfunction = = =

The pituitary gland consists of two parts , the anterior (front) and posterior (back) pituitary . Both parts release hormones that control numerous other organs . In pituitary apoplexy , the main initial problem is a lack of secretion of adrenocorticotropic hormone (ACTH , corticotropin) , which stimulates the secretion of cortisol by the adrenal gland . This occurs in 70 % of those with pituitary apoplexy . A sudden lack of cortisol in the body leads to a constellation of symptoms called " adrenal crisis " or " Addisonian crisis " (after a complication of Addison 's disease , the main cause of adrenal dysfunction and low cortisol levels) . The main problems are low blood pressure (particularly on standing) , low blood sugars (which can lead to coma) and abdominal pain ; the low blood pressure can be life @-@ threatening and requires immediate medical attention .

Hyponatremia , an unusually low level of sodium in the blood that may cause confusion and seizures , is found in 40 % of cases . This may be caused by low cortisol levels or by inappropriate release of antidiuretic hormone (ADH) from the posterior pituitary . Several other hormonal deficiencies may develop in the subacute phase . 50 % have a deficiency in thyroid @-@ stimulating hormone (TSH) , leading to undersecretion of thyroid hormone by the thyroid gland and characteristic symptoms such as fatigue , weight gain , and cold intolerance . 75 % develop a deficiency to gonadotropins (LH and FSH) , which control the reproductive hormone glands . This leads to a disrupted menstrual cycle , infertility and decreased libido .

= = Causes = =

Almost all cases of pituitary apoplexy arise from a pituitary adenoma , a benign tumor of the pituitary gland . In 80 % , the patient has been previously unaware of this (although some will retrospectively report associated symptoms) . It was previously thought that particular types of pituitary tumors were more prone to apoplexy than others , but this has not been confirmed . In absolute terms , only a very small proportion of pituitary tumors eventually undergoes apoplexy . In an analysis of incidentally found pituitary tumors , apoplexy occurred in 0 @.@ 2 % annually , but the risk was higher in tumors larger than 10 mm (" macroadenomas ") and tumors that were growing more rapidly ; in a meta @-@ analysis , not all these associations achieved statistical significance .

The majority of cases (60 ? 80 %) are not precipitated by a particular cause . A quarter has a history of high blood pressure , but this is a common problem in the general population , and it is not clear whether it significantly increase the risk of apoplexy . A number of cases has been reported in association with particular conditions and situations ; it is uncertain whether these were in fact causative . Amongst reported associations are surgery (especially coronary artery bypass graft , where there are significant fluctuations in the blood pressure) , disturbances in blood coagulation or medication that inhibits coagulation , radiation therapy to the pituitary , traumatic brain injury , pregnancy (during which the pituitary enlarges) and treatment with estrogens . Hormonal stimulation tests of the pituitary have been reported to provoke episodes . Treatment of prolactinomas (pituitary adenomas that secrete prolactin) with dopamine agonist drugs , as well as withdrawal of such treatment , has been reported to precipitate apoplexy .

Hemorrhage from a Rathke 's cleft cyst , a remnant of Rathke 's pouch that normally regresses after embryological development , may cause symptoms that are indistinguishable from pituitary apoplexy . Pituitary apoplexy is regarded by some as distinct from Sheehan 's syndrome , where the pituitary undergoes infarction as a result of prolonged very low blood pressure , particularly when caused by bleeding after childbirth . This condition usually occurs in the absence of a tumor . Others regard Sheehan 's syndrome as a form of pituitary apoplexy .

= = Mechanism = =

The pituitary gland is located in a recess in the skull base known as the sella turcica (" Turkish saddle " , after its shape) . It is attached to the hypothalamus , a part of the brain , by a stalk that also contains the blood vessels that supply the gland . It is unclear why pituitary tumors are five times more likely to bleed than other tumors in the brain . There are various proposed mechanisms by which a tumor can increase the risk of either infarction (insufficient blood supply leading to tissue dysfunction) or hemorrhage . The pituitary gland normally derives its blood supply from vessels that pass through the hypothalamus , but tumors develop a blood supply from the nearby inferior hypophyseal artery that generates a higher blood pressure , possibly accounting for the risk of bleeding . Tumors may also be more sensitive to fluctuations in blood pressure , and the blood vessels may show structural abnormalities that make them vulnerable to damage . It has been suggested that infarction alone causes milder symptoms than either hemorrhage or hemorrhagic infarction (infarction followed by hemorrhage into the damaged tissue) . Larger tumors are more prone to bleeding , and more rapidly growing lesions (as evidenced by detection of increased levels

of the protein PCNA) may also be at a higher risk of apoplexy .

After an apoplexy , the pressure inside the sella turcica rises , and surrounding structures such as the optic nerve and the contents of the cavernous sinus are compressed . The raised pressure further impairs the blood supply to the pituitary hormone @-@ producing tissue , leading to tissue death due to insufficient blood supply .

= = Diagnosis = =

It is recommended that magnetic resonance imaging (MRI) scan of the pituitary gland is performed if the diagnosis is suspected ; this has a sensitivity of over 90 % for detecting pituitary apoplexy ; it may demonstrate infarction (tissue damage due to a decreased blood supply) or hemorrhage . Different MRI sequences can be used to establish when the apoplexy occurred , and the predominant form of damage (hemorrhage or infarction) . If MRI is not suitable (e.g. due to claustrophobia or the presence of metal @-@ containing implants) , a computed tomography (CT) scan may demonstrate abnormalities in the pituitary gland , although it is less reliable . Many pituitary tumors (25 %) are found to have areas of hemorrhagic infarction on MRI scans , but apoplexy is not said to exist unless it is accompanied by symptoms .

In some instances , lumbar puncture may be required if there is a suspicion that the symptoms might be caused by other problems (meningitis or subarachnoid hemorrhage) . This is the examination of the cerebrospinal fluid that envelops the brain and the spinal cord ; the sample is obtained with a needle that is passed under local anesthetic into the spine . In pituitary apoplexy the results are typically normal , although abnormalities may be detected if blood from the pituitary has entered the subarachnoid space . If there is remaining doubt about the possibility of subarachnoid hemorrhage (SAH) , a magnetic resonance angiogram (MRI with a contrast agent) may be required to identify aneurysms of the brain blood vessels , the most common cause of SAH .

Professional guidelines recommend that if pituitary apoplexy is suspected or confirmed , the minimal blood tests performed should include a complete blood count , urea (a measure of renal function , usually performed together with creatinine) , electrolytes (sodium and potassium) , liver function tests , routine coagulation testing , and a hormonal panel including IGF @-@ 1 , growth hormone , prolactin , luteinizing hormone , follicle @-@ stimulating hormone , thyroid @-@ stimulating hormone , thyroid hormone , and either testosterone in men or estradiol in women .

Visual field testing is recommended as soon as possible after diagnosis , as it quantifies the severity of any optic nerve involvement , and may be required to decide on surgical treatment .

= = Treatment = =

The first priority in suspected or confirmed pituitary apoplexy is stabilization of the circulatory system . Cortisol deficiency can cause severe low blood pressure . Depending on the severity of the illness , admission to a high dependency unit (HDU) may be required .

Treatment for acute adrenal insufficiency requires the administration of intravenous saline or dextrose solution ; volumes of over two liters may be required in an adult . This is followed by the administration of hydrocortisone , which is pharmaceutical grade cortisol , intravenously or into a muscle . The drug dexamethasone has similar properties , but its use is not recommended unless it is required to reduce swelling in the brain around the area of hemorrhage . Some are well enough not to require immediate cortisol replacement ; in this case , blood levels of cortisol are determined at 9 : 00 AM (as cortisol levels vary over the day) . A level below 550 nmol / l indicates a need for replacement .

The decision on whether to surgically decompress the pituitary gland is complex and mainly dependent on the severity of visual loss and visual field defects . If visual acuity is severely reduced , there are large or worsening visual field defects , or the level of consciousness falls consistently , professional guidelines recommend that surgery is performed . Most commonly , operations on the pituitary gland are performed through transsphenoidal surgery . In this procedure , surgical instruments are passed through the nose towards the sphenoid bone , which is opened to give

access to the cavity that contains the pituitary gland . Surgery is most likely to improve vision if there was some remaining vision before surgery , and if surgery is undertaken within a week of the onset of symptoms .

Those with relatively mild visual field loss or double vision only may be managed conservatively , with close observation of the level of consciousness , visual fields , and results of routine blood tests . If there is any deterioration , or expected spontaneous improvement does not occur , surgical intervention may still be indicated . If the apoplexy occurred in a prolactin @-@ secreting tumor , this may respond to dopamine agonist treatment .

After recovery , people who have had pituitary apoplexy require follow @-@ up by an endocrinologist to monitor for long @-@ term consequences . MRI scans are performed 3 ? 6 months after the initial episode and subsequently on an annual basis . If after surgery some tumor tissue remains , this may respond to medication , further surgery , or radiation therapy with a " gamma knife " .

= = Prognosis = =

In larger case series , the mortality was 1 @.@ 6 % overall . In the group of patients who were unwell enough to require surgery , the mortality was 1 @.@ 9 % , with no deaths in those who could be treated conservatively .

After an episode of pituitary apoplexy , 80 % of people develop hypopituitarism and require some form of hormone replacement therapy . The most common problem is growth hormone deficiency , which is often left untreated but may cause decreased muscle mass and strength , obesity and fatigue . 60 ? 80 % require hydrocortisone replacement (either permanently or when unwell) , 50 ? 60 % need thyroid hormone replacement , and 60 ? 80 % of men require testosterone supplements . Finally , 10 ? 25 % develop diabetes insipidus , the inability to retain fluid in the kidneys due to a lack of the pituitary antidiuretic hormone . This may be treated with the drug desmopressin , which can be applied as a nose spray or taken by mouth .

= = Epidemiology = =

Pituitary apoplexy is rare . Even in people with a known pituitary tumor , only 0 @.@ 6 ? 10 % experience apoplexy ; the risk is higher in larger tumors . Based on extrapolations from existing data , one would expect 18 cases of pituitary apoplexy per one million people every year ; the actual figure is probably lower .

The average age at onset is 50 ; cases have reported in people between 15 and 90 years old . Men are affected more commonly than women , with a male @-@ to @-@ female ratio of 1 @.@ 6 . The majority of the underlying tumors are " null cell " or nonsecretory tumors , which do not produce excessive amounts of hormones ; this might explain why the tumor has often gone undetected prior to an episode of apoplexy .

= = History = =

The first case description of pituitary apoplexy has been attributed to the American neurologist Pearce Bailey in 1898 . This was followed in 1905 by a further report from the German physician Bleibtreu . Surgery for pituitary apoplexy was described in 1925 . Before the introduction of steroid replacement , the mortality from pituitary apoplexy approximated 50 % .

The name of the condition was coined in 1950 in a case series by physicians from Boston City Hospital and Harvard Medical School . The term " apoplexy " was applied as it referred to both necrosis and bleeding into pituitary tumors .