| Skin. | Serum. | Urine. | Fæces. |
|---|---|---|---|
| 1. Very slight yellow | Bilirubin 0 | Bilirubin 0 ..... Urobilin 0 or little | Normal color. |
| 2. Light yellow..... | Bilirubin + | Bilirubin − ..... Urobilin + ..... | Colored. |
| 3. Yellow ..... | Bilirubin + | Bilirubin + ..... Urobilin + ..... | Pale. |
| 4. Deeply yellow ... | Bilirubin + | Bilirubin + ..... Urobilin + or 0.. | Clay color. |

Besides bilirubin and urobilin the urine contains bile acids and at times nucleo-albumin and albumin. Bile-stained cells and hyaline and finely granular casts are found in all jaundice urines.

3. Pruritus is frequent, and in marked jaundice may be severe and tormenting. It is an intoxication symptom, and largely modified by individual peculiarity; it may precede the jaundice, and in fact be present for long periods without jaundice, as in hepatic cirrhosis; but as a rule it is not intense save in complete and long-standing obstruction. It may cease when bile reappears in the stools, though the skin still remains colored. Urticaria, eczema, fissures, and boils occur as a result of scratching. Xanthoma, xanthelasma, or vitiligoidea is a peculiar condition characterized by formation of yellowish flat patches or tubercles; the flat variety occurs on the eyelids, the tubercular form elsewhere on the skin or in the viscera. The association with icterus is not a necessary one. Sweating is frequent and may be confined to the back or abdomen. Telangiectases may develop in chronic cases in the skin and occasionally in the mucous membrane of the tongue and lips. Clubbing of the nails has been occasionally observed, and periosteal nodes may form.

4. The color of the fæces may be modified. In total obstruction the stools may be pasty and more or less grayish-white or clay-colored. The color is due partly to absence of modified bile pigment, and partly to the large amount of undigested fat; according to F. Mueller, from fifty-five to seventy-eight per cent. of fat goes to waste when bile is wholly shut off from the intestines, instead of normally from seven to ten per cent. With partial obstruction the stools are more colored; return of color may be the first sign of relief from total obstruction. Formerly much stress was laid on the antiseptic properties of bile, but we now know that the bile has little influence on bacterial growth and controls but little the odor of the fæces.

5. Slow pulse is a common symptom, especially of catarrhal jaundice. There may be 60, 50, or even as low as 30 or 20 beats a minute. The phenomenon is variously attributed to action of bile acids on the vagus, heart muscle, or intracardial ganglia; irritation of the vagus is the most probable cause, for Wintrend has demonstrated a rise from 40 to 120 after atropine injection. Later, in a chronic jaundice, an originally slow pulse may rise to normal or increased rate.

6. Disturbances of vision are rare—xanthopsia, hemeralopia, nyctalopia.

7. Digestive disorders are common but equivocal. The usual complaints are of anorexia, bitter taste in the mouth, distaste for meats or fats, flatulence, constipation, or occasional diarrhœa.

8. Nervous symptoms are of many kinds. Physical and psychical weakness, depression, irritability are present in mild cases; with persistent jaundice severe disturbances may occur. The general condition grows worse, a typhoid state develops, dulness and stupor deepen into coma that proves fatal, coma alternates with states of excitement and delirium, or general convulsions of indefinite nature end the scene. The symptoms directly suggest intoxication, and the condition has long borne the name of cholæmia. The name is not a good one, as the same group of symptoms may terminate a cirrhosis of which jaundice forms no part. It is an auto-intoxication of complex kind, as shown by the variety and inconstancy of the symptoms. The term hepatic intoxication, proposed by Quincke, should supersede cholæmia.

9. Hemorrhage. The presence of bile constituents slows coagulation of the blood, and in long-continued icterus, instead of the normal time of three and a half to four minutes, coagulation may be delayed to eleven or twelve minutes (Osler). The tendency to bleeding is shown in spontaneous hemorrhages—purpura, suggillations, more rarely bleeding from mucous membranes, or by profuse and fatal hemorrhage after operations. It is well known that surgeons operate with dread in cases of long-standing jaundice.

II. *Toxæmic Jaundice.*—In this form obstruction depends upon increased viscidity of bile, due to blood changes or to catarrh of small bile ducts; no obvious obstruction is to be found in large ducts. Bile is never absent from the fæces; in fact, the stools may be very dark from excess of bile (polycholia). The bile acids are not constant in the urine, but this is of no clinical importance. Coloring of the skin is usually less deep, constitutional disturbances are as a rule decidedly more marked; the jaundice seems often merely a symptom of a general infection. All the cases of this group present about the same clinical picture; differences in the symptoms and course are due to the variety and especially to the intensity of the intoxication. There may be gradations from an apparently simple epidemic catarrhal jaundice to the syndrome of malignant jaundice or Weil's disease, or to the severest type of icterus gravis or acute yellow atrophy. For further discussion of this group, see articles on *Phosphorus Poisoning, Weil's Disease, Yellow Fever, Liver Diseases: Acute Yellow Atrophy.*

Morbid Anatomy and Course.—The pathological findings of icterus vary widely with the causes; they are sufficiently discussed in connection with symptomatology or in the sections dealing with the special diseases. The course and prognosis vary also with the cause; in general, prognosis is less good when obstructive jaundice has lasted three or four months; after eight to twelve months liability to hemorrhage or to sudden severe nervous symptoms renders the outlook unfavorable. Budd, however, cites recovery after four years; Murchison, Barth, and Bismer report a favorable termination after six years' duration; Legendre, Gailliard, and Debove mention cases of complete obstruction of twelve, twenty, twenty-five years' standing without much general disturbance!

Varieties of Jaundice.—1. *Icterus Neonatorum.*—Jaundice of the newborn may be (*a*) severe, due to congenital stricture or absence of the bile ducts, to syphilis, or to sepsis; this form rapidly proves fatal; (*b*) mild or physiological. This occurs in one-third or two-thirds of all infants born in hospital, and in a somewhat smaller per cent. of private cases. It is more frequent in boys, in premature infants, in cases in which chloroform was used, or in cases attended with marked congestion. The jaundice appears on the second or third day, is most marked in the face and upper part of the body, as a rule is not deep, the conjunctivæ are stained only in severe cases, there is little or no general disturbance, the color fades in from a few days to three or four weeks. The urine, as a rule, is of normal yellow color and contains no soluble bile pigment; it frequently shows traces of albumin, and the sediment may show bile-stained kidney epithelium or cells enclosing granules or crystals of bilirubin. Bilirubin is held in the kidney in the form of infarcts. There is no urobilinuria; the fæces are of normal yellow color. Pathogenesis is obscure. The benign character shows the practical physiological nature of the process; it may depend in part on the increased blood destruction and consequent polycholia of the first days after birth, in part on the slow excretion of bile by the kidney (infarct formation), in part on lack of bile reduction in the intestine. More probable is the explanation of Franck and Quincke that the icterus depends on increased bile absorption from the intestines; the meconium contains bilirubin, bile secretion is increased with ingestion of the first food, bile is consequently absorbed in quantity into the portal blood, and in the first few days patency of the ductus venosus Arantii allows the bile constituents to enter in part the





vena cava and so reach the general blood stream without passing the liver.

2. *Icterus after Hemorrhages.*—Definite icterus has been observed after blood extravasations and internal hemorrhages. The staining appears in from three to ten days after the hemorrhage, is of slight degree, and fades in a few days or weeks. Urobilinuria accompanies and, in fact, precedes the jaundice; it is extremely rare to find bilirubin in the urine. Elaboration of the bile pigment probably does not take place locally; hæmatoidin crystals may form, but this is a slow process and the crystals show little tendency to solution. More probable is the solution of hæmoglobin *in situ* and its transformation into bilirubin in the liver; the jaundice is hepatogenous, an icterus pleiochromicus. With small extravasations no jaundice occurs, only urobilinuria.

3. *Inanition Icterus.*—Slight staining of the conjunctivæ or skin may occur in inanition or starvation. Trendelenburg observed a case with slight bilirubinuria. It is a common event to find bile in the urine of fasting dogs—the absorption occurs within the liver.

4. *Icterus Syphiliticus.*—This is the icterus syphiliticus præcox. It occurs in the secondary stage, is not frequent, occurs oftener in women (Fournier). The cases show generally severe secondary symptoms, eruptions, and marked glandular enlargements (Werner). It is a mechanical jaundice and due to swelling of the glands in the portal fissure (Lancereaux). In one case Quincke observed ascites and splenic tumor coming and going with the jaundice.

5. *Icterus Psychicus, Icterus Spasticus, Icterus Ex emotione.*—In the minds of the laity the emotions play a large part in liver pathology. The only cases of jaundice that can be ascribed to nerve influence are those which occur within a few hours or even minutes after a sudden nerve shock, as fright, anger, fear. There are two classes of such cases: 1. Jaundice coming on immediately after severe shock; in all literature examples of this class are extremely rare; two cases of Villeneuve (1818) are cited by Murchison. 2. Jaundice occurring a few hours after great nerve shock or strain. This is comparatively common; the jaundice is light and of short duration; in a few cases acute yellow atrophy has followed. Various explanations have been advanced—polycholia, lowered portal pressure (Frerichs). The most probable explanation is that of spasmodic contraction of the bile ducts with increased back pressure and quick absorption.

*Herbert C. Moffitt.*

**JAWS, INJURIES AND DISEASES OF.** — Injuries and Diseases of the Upper Jaw.—The upper jaw is peculiar from the fact of its possessing a large cavity, the antrum of Highmore. This cavity is situated in the body of the bone, and is lined with mucous membrane continuous with that of the nasal cavity through a small orifice opening into the middle meatus.

On account of its structure the upper jaw is more subject to diseases than the lower. The affections of the bone calling for surgical interference are injuries, inflammation and abscess, cystic diseases, and tumors.

Fractures of the Upper Jaw.—Owing to the position of the upper jaw, protected on all sides by its outlying processes of bone—the malar bone externally and the nasal bones internally—fracture of the upper jaw is not a very frequent accident. Almost invariably fracture of this bone is associated with fracture of the more prominent bones of the face, with which it is articulated. Direct violence, such as blows upon the face, falls from great heights, etc., is usually the cause of the fracture.

The fracture may be of the penetrating variety, consisting of a small opening into the antrum made by a sharp-pointed instrument, which may enter by way of the orbit, the palate, the nostril, or the anterior wall of the cavity. Such wounds, as a general rule, heal rapidly, and require but little attention on the part of the surgeon.

Fracture may involve any part of the bone—the nasal, palatal, or alveolar process, or the body of the bone. As the result of falls upon the face from great heights, the fracture, in a few recorded cases, has been vertical in the median line, constituting a diastasis or separation of the two superior maxillary bones.

Comminuted fractures, attended with the most frightful deformity, as the result of gunshot wounds, are occasionally met with.

When the alveolar process is separated from the body of the bone there is usually marked displacement.

The anterior wall of the antrum of Highmore is sometimes crushed in by fragments of the malar bone driven down upon it by the force of blows.

The soft parts overlying the fracture are nearly always extensively involved. Hemorrhage from wounds of branches of the internal maxillary artery is occasionally very profuse—sometimes even requiring the ligation of the common carotid artery, or the application of the actual cautery to the bleeding point.

When a fracture of the nasal process of the upper jaw is complicated with a fracture of the nasal bones in which the mucous membrane of the nose has been more or less lacerated, extensive emphysema of the face may take place.

If the line of fracture runs through the infra-orbital foramen, causing contusion or laceration of the infra-orbital nerve, temporary paralysis of the parts supplied by that nerve may ensue.

Obstruction of the lachrymal duct, with a constant overflow of tears upon the cheek, may follow fracture of the upper jaw.

*Symptoms.*—In the majority of cases recognition of fracture of the upper jaw is not difficult. Deep-seated pain, increase of saliva, hemorrhage from the mouth, and the special signs of fracture, viz., crepitus, preternatural mobility, and deformity, are all present in greater or less degree. The accessible position of every part of the bone makes it usually an easy matter to detect a fracture of the upper jaw.

*Treatment.*—In the treatment of fractures of the upper jaw the indications are to replace, by manipulation, the fragments as accurately as possible, and, by suitable appliances, to render them immovable. Pressing the lower jaw firmly against the upper with a bandage will in most cases suffice.

If the tendency to displacement is great, as in fractures of the alveolus, it may be necessary to wire the teeth of opposing fragments together, or to adjust a gutta-percha or vulcanite interdental splint.

When the fracture is comminuted and compound, great care should be taken to preserve every fragment, however loosely attached, as the experience of a great many surgeons has shown that such fragments reunite very readily. Another point to be observed in the treatment of fractures of the upper jaw is not to extract loosened teeth, as, in addition to the fact that they most frequently become firm again, their extraction is attended with some danger of removing fragments of bone that might have been preserved.

Repair in cases of average severity takes place in from thirty to forty days with a scanty formation of callus, and not infrequently in less time. The vitality of the bone is exceptionally great; hence the rule laid down by Malgaigne and some of his predecessors, and repeated by all subsequent writers, to leave every fragment that is not absolutely and entirely detached. Although this rule is a sound one, it occasionally happens that fragments become necrosed and have to be removed.[6]

Inflammation, either acute or chronic, may attack the mucous membrane of the antrum or the periosteum of the bone. The cause of the inflammation is most commonly irritation set up by carious teeth, though it may originate from mechanical injury, from the poisonous effects of syphilis, scrofula, the exanthematous fevers, mercury, or phosphorus. Its tendency is to run rapidly on to suppuration, and in the majority of cases this process has been already established when the surgeon is called.

When the mucous membrane of the antrum is in-

flamed, the symptoms are by no means clear. Aching of the molar teeth is present, there is more or less puffy, œdematous swelling of the cheek, and occasionally there may be observed a discharge of mucus from the nostril of the affected side.

In periostitis there is always severe pain of a throbbing, tensive character, aggravated at night; swelling of the cheek, often so great as to distort the features, is also present; the teeth are raised in their sockets, and the least pressure upon them gives rise to the sharpest pain.

*Treatment.*—In order to avert suppuration the treatment should be prompt and active. All decayed teeth should be at once removed as the most probable causes of the mischief. Saline cathartics should be exhibited, and local depletion by means of leeches applied to the gums, or free incisions, together with hot fomentations, should be employed.

Alveolar Abscess, the immediate effect of inflammation at the root of a tooth, may be superficial or deep. When superficial it is commonly known as gumboil, which is recognized as a puffy swelling of the gums, usually small in volume, but often exquisitely tender and painful. This form of abscess, after a brief period, ruptures spontaneously or upon slight pressure with the finger, and recovery speedily ensues.

The deep alveolar abscess, which more directly results from diseased teeth, commences in the substance of the bone. The abscess cavity, at first very small, rapidly increases in size, the alveolar process becoming carious and undergoing absorption. The pus may find an outlet for itself by the side of a tooth, or, if resistance in that direction is too great, the alveolar process may be perforated and the pus burrow beneath the mucous membrane. Occasionally the pus burrows beneath the periosteum of the palate, afterward pointing in the roof of the mouth.

*Treatment.*—The treatment of alveolar abscess is free incision and extraction of the peccant tooth. This should be done early, as delay may lead to extensive necrosis, or to the formation of a long sinus, most difficult to heal.

Suppuration in the Antrum.—Accumulation of pus within the antrum—erroneously termed abscess, more properly empyema of the antrum—is most frequently caused by irritation set up by diseased fangs of teeth which normally project upward into the cavity and form prominences upon its floor. The teeth most usually involved are the first and second molars, though it may be the bicuspid or canine. Only a thin partition of bone separates the roots of these teeth from the cavity, and not infrequently the root of one or more of these teeth penetrates the cavity and lies in contact with the antral mucous membrane. The disease may also depend upon a catarrhal inflammation of the lining membrane, may follow violent blows upon the face, or arise by extension of inflammation from the nasal cavity, or from suppurative degeneration of cysts of the antrum.

*Symptoms.*—If very rapid in its formation, the symptoms of suppuration in the antrum are pain in the head and face, aching of the teeth on the affected side, swelling of the face and gums, and the discharge of an offensive pus into the nose when the patient is recumbent or forcibly blows the nose. The constant discharge of fetid pus through the nose often occasions the mistake that the disease is ozæna, but the character of the matter and the fact that the fetor is most perceptible to the patient, are sufficient marks of distinction. Digestion is much disturbed by the constant entrance of pus into the stomach, and the general health of the patient is on that account often very much impaired.

If the suppurative process has been very slow and gradual, the symptoms are hardly sufficient to attract attention until the disease has made considerable progress.

The pus most usually finds an exit for itself through the opening from the antrum into the nose, or into the mouth along the side of diseased teeth. Expansion of the bone rarely occurs, except when no outlet for the escape of pus is afforded. When there exists no means of escape for the pus and it accumulates in the cavity, the bone becomes expanded, the cheek is pushed forward, and the walls of the antrum become so thinned by absorption that when pressed upon a peculiar crackling sensation is felt. The bone may be expanded upon any or all of its surfaces, orbital, buccal, palatal, or nasal. In several recorded cases the pressure upward has caused protrusion of the eyeball with permanent amaurosis. Obstruction of the lachrymal duct by the expansion of the bone frequently brings about a constant overflow of tears upon the cheek.

*Treatment.*—The treatment of suppuration in the antrum consists in providing a free opening for the pus to escape before extensive destruction of the walls of the cavity has taken place. This may be effected by the extraction of a tooth on the affected side, preferably the first molar, and enlarging the opening through the socket by means of a trocar or drill. In edentulous jaws, attempts to penetrate into the antrum through the alveolus should never be made, as under these circumstances the bone is greatly thickened and consolidated. The most effectual method of evacuating the pus is to make the opening above the alveolar process by means of a drill, a carpenter's gimlet, or an ordinary trocar, care being taken that the instrument is not driven upward with such force as to pierce the orbital plate.

If the opening has been made through the socket of a tooth, the passage should be kept closed with a plug of cotton, or a gutta-percha or metallic plate adjusted over the teeth to prevent the entrance of food into the cavity.

The cavity should be frequently syringed out through the opening with an antiseptic solution—corrosive sublimate, 1 : 2,000, or carbolic acid, 1 : 30.

The most assiduous attention is necessary to bring about a perfect cure, and often months elapse before the disease may be said to be at an end.

Cystic Disease of the Antrum.—In this disease the antrum becomes distended by a dark-colored, glairy, and in some instances gelatinous fluid, which frequently contains cholesterin in considerable quantity. The old name applied to the disease was *hydrops antri*, or dropsy of the antrum, and it was supposed to depend upon the retention of the natural secretion of the mucous membrane lining the sinus, the escape of which had been prevented by the closure of the opening between the antrum and the nose; but modern research has shown that such a view was not correct.

The cysts most likely depend upon cystic degeneration of the glandular follicles thickly aggregated over the mucous membrane lining the cavity.

Fig. 2977.—Cystic Tumor of Antrum. (Erichsen.)

*Symptoms.*—The disease is of painless growth and the expansion of the bone gradual. In course of time it leads to marked deformity—the cheek becomes prominent and round; the eye protrudes from the orbit; the nose is pushed to the opposite side; the nostril becomes occluded; and the palate is depressed, often to such an extent as seriously to embarrass deglutition.

The enlargement presents itself as a rounded tumor, soft and elastic at some portions of its surface, hard and resisting at others. Pressure upon the swelling often elicits the peculiar egg-shell crackling characteristic of those conditions in which the bone is greatly expanded and thinned. The general appearance of the disease closely resembles that of solid tumors of the upper jaw, which fact has caused surgeons, in a number of instances, to excise the entire upper jaw unnecessarily. In all doubtful cases of swelling of the upper jaw, therefore, exploratory punctures should be made before resort is had to the more serious operation of excision.





*Treatment.*—Acting upon the false belief that the enlargement consisted of the pent-up secretion of the antral mucous membrane, surgeons formerly attempted to re-establish the normal opening between the sinus and the nose, but naturally such a procedure never met with success.

The proper treatment consists of the evacuation of the contents of the cyst by means of free incisions, and the establishment of efficient drainage until the tendency to recurrence no longer exists. This may be easily accomplished by incising the most prominent part of the tumor, usually beneath the cheek, evacuating the contents through the opening, and dilating the passage thoroughly with the finger. If the cyst is large, a portion of the bone or of the cyst wall should be cut away. The cavity should be thoroughly washed out, several times daily, with some stimulating or antiseptic solution until all discharge ceases. The deformity occasioned by the distention of the bone will eventually entirely disappear.

Polypus of the Antrum.—This form of morbid growth in the antrum is rare. Like polypus of the nasal cavity, to which it is similar in pathology, it takes its origin from the mucous membrane, and may be either fibrous or gelatinous, most frequently the latter.

When small its presence is unsuspected, and it is only after it has attained considerable volume and has, by its size, led to absorption of the thin internal wall of the antrum, and protruded into the nostril, that the real nature of the disease is manifested.

Until this form of growth reaches large dimensions, surgical interference is rarely called for. Thorough removal, by opening up the anterior wall of the antrum, or through the nose if possible, is the proper method of treatment.

Dentigerous Cysts develop in the jaw in consequence of some error in the growth and eruption of a tooth, most frequently a permanent one, though Heath mentions a case in which the tooth involved was of the temporary set. Tomes believes that dentigerous cysts are the result of the gradual increase of the small amount of fluid left in the tooth sac after development of the enamel. This form of cysts most frequently occurs in young adults. In the upper jaw they nearly always occupy the antrum.

In general appearance dentigerous cysts strongly resemble simple cysts, described above. They cause a slow, painless enlargment of the jaw, which, after it has reached a considerable size, crackles upon pressure, though this symptom is not constant, on account of the thick and highly organized wall of the cyst.

*Treatment.*—The treatment of dentigerous cysts is the same as that of simple cysts, namely, free incision and evacuation of their contents. The contained tooth, which is usually found embedded in or lying loose upon the cyst wall, should be removed, and a portion of the sac cut away. The operation should, if possible, be performed from within the mouth. Entire recovery, without deformity, usually follows the operation.

Solid Tumors of the Upper Jaw—Fibromata.—Fibrous tumors of the upper jaw may be either endosteal or periosteal in origin, and may occupy the antrum of Highmore or grow from the alveolar process, the latter variety being known as fibrous epulis.

In structure, fibromata are similar to fibrous tumors of other parts of the body, and are liable to the same kinds of degenerative changes.

The upper jaw is not so often the seat of fibrous tumors as the lower.

Frequently these growths contain spicula of bone or nodules of cartilage, either of which may be present in large quantity.

Inflammation resulting from the irritation of decayed teeth or mechanical injury may be the starting-point of the disease. More frequently, however, the cause is not apparent.

Though usually of slow growth, fibromata occasionally reach enormous dimensions. When originating within the antrum, a fibroma may extend in every direction. The bony walls of the cavity give way before it and undergo absorption. Processes of the growth may extend into the mouth, the nasal cavity, and the orbit, and distend the cheeks, giving rise to the most hideous deformity. The health of a patient who is the subject of fibroma of the upper jaw usually remains unimpaired.

Fibrous Epulis is a small, firm tumor of fibrous structure, which grows from the periosteum of the alveolar process close to the junction of the gum with the teeth, or even between the teeth. It grows slowly and painlessly, and seldom reaches a large size, though a few cases have been reported in which such outgrowths have attained sufficient volume to cause considerable deformity. As the tumor increases in size the adjacent teeth become loosened, and eventually drop out. It bleeds when manipulated, and is not infrequently ulcerated on account of the pressure of the teeth of the lower jaw. As in fibromata of the body of the jaw, epulis frequently contains bony spicula, which radiate into its substance from the attachment of the tumor to the jaw.

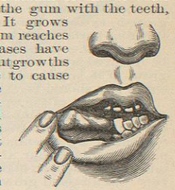

Fig. 2978.—Epulis of Lower Jaw. (Erichsen.)

Fibromata may be distinguished from malignant tumors of the upper jaw by their slowness of growth, their hard and resisting consistence, the absence of pain, their independent growth, and the immunity of the lymphatic glands.

*Treatment.*—When the tumor is located within the antrum and is of moderate size, it may be possible to enucleate it from within the mouth without disfigurement of the face. This may be accomplished by dissecting the cheek from the bone and entering into the antrum through its anterior wall.

If the growth is large, and has in a measure substituted itself for the upper jaw, nothing less than complete excision of the bone will suffice. In the treatment of epulis thorough removal of the growth, with a portion of the bone from which it sprang, should be done to insure against a return of the disease.

Enchondromata.—Pure cartilaginous tumors of the upper jaw are extremely rare. They may grow from the surface of the bone or from within the antrum. They usually appear early in life, and grow more rapidly than fibrous tumors. Enchondromata may reach immense size, as in the case reported by O'Shaughnessy, who removed a tumor of this kind, together with the upper jaw, which weighed four pounds.

In general appearance and in progress the enchondroma differs so little from the fibroma that during life it is impossible to differentiate between them. Ossification of the growth is a very frequent occurrence, and it is not unlikely that nearly all osseous tumors were originally cartilaginous. The tendency to recur is much greater than it is in the case of fibrous tumors, and for this reason extirpation of enchondromata should be most thorough. Eight operations for the removal of enchondroma of the upper jaw were performed upon a patient whose case has been reported by Fergusson. It is not unlikely that the disposition of enchondromata to recur has been greatly exaggerated, as, no doubt, in many cases sarcomatous tumors which have undergone chondrification have been regarded as originally cartilaginous.

*Treatment.*—The treatment of enchondromata should be the same as applies to fibromata, except that the surgeon should be even more careful to go wide of the disease, in order to guard against recurrence.

Osteomata are more frequently met with in the lower than in the upper jaw. This form of tumor in its structure possesses all the characteristics of true bone. It may be cancellous in structure, enclosed in a thin casing

of compact bone, or of denser consistence, hard and compact throughout like ivory.

Hyperostosis is a disease of the jaw which consists of a diffused hypertrophy of the bone, with frequently total obliteration of the antrum. Partial hyperostosis may take place in the alveolar process as the result of irritation proceeding from a misplaced or diseased tooth.

Osteomata of the upper jaw have been known to become loose in their attachments, and finally to become spontaneously detached.

It is not an easy matter to distinguish an osteoma from an enchondroma, or even from a fibroma, but its slow growth, extreme hardness, and irregular, nodulated, or tuberous surface will be of service in making a diagnosis.

*Treatment.*—Osseous tumors of the upper jaw should be removed with the part of the bone from which they grow, or if large and the source of great deformity, the entire jaw should be excised.

Sarcomata of the upper jaw are tumors of connective-tissue origin, made up chiefly of embryonic cells. They are met with most frequently in early and middle life. Sarcomata are essentially malignant in nature, being almost certain to recur after removal, and in their growth infiltrating the neighboring tissues. The sarcomata are very vascular and grow rapidly, often reaching immense volume. They are conveniently divided into three classes, according to the kind of cells that enter into their composition—namely, the spindle-celled, the round-celled, and myeloid or giant-celled.

The spindle-celled sarcoma is most frequently found in the antrum. It is made up of spindle-shaped cells of varying size, closely packed in a homogeneous basis substance, held together by a scanty fibrous tissue. It closely resembles the fibroma in general appearance.

The round-celled sarcoma, as its name implies, is composed principally of large, round cells, very greatly resembling leucocytes. Both spindle-shaped and round cells are occasionally found in the same tumor. Both varieties frequently undergo osseous or cartilaginous transformation, often to such an extent as to mask the real nature of the neoplasm. When the tumor occupies the antrum it pursues the same course as other solid tumors of that cavity, causing enlargement of the bone, bulging of the cheek, etc., but differs from them in that it grows more rapidly, is more prone to ulcerate, is very vascular, is of soft consistence in the majority of cases, and the lymphatic glands frequently become secondarily affected.

The myeloid sarcoma occurs at an early age, and in most cases grows from the alveolar process, where it is known as myeloid epulis. In structure it is composed of large polynucleated cells. This form of sarcoma grows rapidly, is extremely vascular, and is soft and elastic to the touch.

*Treatment.*—No matter how thoroughly sarcomata of the upper jaw are removed, their malignancy is manifested by the fact that in the majority of cases they recur. Occasionally they have been removed, together with a large portion of the bone from which they grew, with perfect success; and in exceptional cases, when the growth is small and in a measure isolated, it may be expedient to excise it with a portion of the bone; but when the nature of the tumor is clearly apparent, and when it has reached a large size, nothing short of complete excision of the entire upper jaw will be of any avail.

Epithelioma is the only form of carcinomatous growth connected with the jaws.

There are two distinct varieties of epithelioma of the upper jaw: the squamous, which grows from the gums, or from the mucous membrane of the palate, and the columnar, which always commences in the nasal cavity or the antrum. Epithelioma is rarely met with before the age of forty.

The squamous epithelioma usually commences as a small ragged ulcer of the gum or the palate. As the ulcerative process extends, the bone gives way before it, and the antrum is invaded. This cavity soon becomes filled with the epitheliomatous deposit, and the surrounding tissues are rapidly infiltrated. The antrum becoming overdistended with the mass, the external walls yield, the cheek bulges, the nostril is occluded, the orbital plate is encroached upon, and the eye protrudes. The skin over the tumor is stretched, and eventually becomes livid. Later on, the skin gives way and an irregular ulcer is formed, through which protrudes a fungous mass, from the surface of which a fetid, thin, muco-purulent fluid is constantly discharged. Profuse hemorrhages are not infrequent.

The lymphatic glands beneath the jaw, behind the ear, and at the temple become involved in the advanced stages of the disease.

The progress of the disease is variable, being sometimes very rapid, at other times slow.

The columnar epithelioma grows either from the mucous membrane of the palate or from that of the antrum. It is invariably of rapid growth. It is usually softer than the squamous variety. When growing from the antrum, it pursues the same course and presents the same symptoms as squamous epithelioma.

When the tumor occupies the nostril, it is liable to be mistaken for nasal polypus.

*Treatment.*—When epithelioma attacks the upper jaw, complete excision of the bone should be the rule, and the earlier in the course of the disease it is done the greater the chance of preventing its return or the longer the immunity from recurrence.

Thorough eradication of the disease should be the object of the surgeon. Even when there can be no hope of removing all the disease, an operation is nearly always advisable, as it may prolong life and render the patient more comfortable.

Operations upon the Upper Jaw.—The nature of the operation is determined by the character and extent of the morbid growth. If the tumor is innocent, care should be taken to disfigure the face as little as possible, and to sacrifice no more of the bone than is absolutely necessary.

Very often, when the tumor is small and confined to a limited portion of the bone, it may be removed from within the mouth after dissecting up the cheek from its attachments.

If it is impossible to effect this by reason of its position and attachments, a tumor of considerable size may be sufficiently exposed, by means of an incision through the lip in the median line, carried into the nostril of the affected side alongside the septum nasi, and the cheek then dissected from the bone. When the growth is confined to the antrum—a polypus, for example—it may be reached and removed by means of this incision through the anterior wall of the antrum, or from within the mouth, without external incision through the palatal process.

When the growth is of great size, or when it belongs to the malignant or rapidly growing sarcomatous class of tumors, nothing less than excision of the entire upper jaw should be undertaken.

Prof. S. D. Gross gives the credit of the first removal of the upper jaw to Dr. Jameson, of Baltimore, Md., who successfully performed the operation in 1820; but the honor is by other writers given to Gensoul, of Lyons, whose case occurred in 1827. Lizars, Liston, Syme, Mott, Dupuytren, Heath, and others have repeatedly extirpated the upper jaw successfully, but the established position of the operation is, in great measure, due to important modifications suggested by Sir William Fergusson.

The special instruments required for excision of the upper jaw are strong, angular bone forceps, a small, strong saw with a movable back, chisels, gouges, and a Fergusson lion forceps.

The patient is placed in a recumbent position, and fully anæsthetized. An incision is carried in the median line through the lip to the nostril; thence around the ala and along the side of the nose to near the inner canthus of the eye, where it is joined by a curved incision begun over the zygoma, near the outer canthus, and carried along





the lower margin of the orbit. The large flap of integument thus marked out is rapidly dissected up and reflected outward. This incision, proposed by Fergusson, is preferable to that originally employed by Gensoul and Lizars, as it divides the facial arteries and nerves where they are of smallest size, and the resulting cicatrix is not nearly so unsightly. The tumor having been thoroughly exposed, an incisor tooth of the affected side is extracted, a small saw carried into the nostril corresponding to the growth, and the palatal process nearly or wholly divided. The nasal and malar processes, in the order named, are divided or deeply notched with the saw.

If the orbital plate is not involved in the disease, it should be preserved by making a section of the bone below the orbit by the saw horizontally applied. If the disease involves the upper part of the bone, it may be expedient to leave the alveolar process.

The bony attachments of the jaw are completely severed by the bone forceps; the jaw is firmly grasped by the lion forceps and forcibly depressed. The remaining attachments are thus brought into view, and their division is effected with the knife or the forceps. The infra-orbital nerve should be cleanly divided, and as much of the soft palate preserved as possible.

The jaw having been taken away, any remains of the growth should be removed with the gouge, and roughened points of bone cut off with bone forceps. Hemorrhage during the operation is usually trifling, in many cases not a ligature being required. The entrance of blood into the larynx may be effectually prevented by placing a small sponge, with string attached, in the back part of the mouth, and by frequently removing the accumulations with sponge and fingers. Preliminary ligation of the common carotid artery, or the performance of tracheotomy, together with the use of the trachea tampon as practised by Trendelenburg, are entirely unnecessary measures.

After the removal of the jaw all bleeding points that can be should be ligated, and Paquelin's thermocautery applied to vessels beyond the reach of the ligature. The cavity left by the removal of the jaw should be dusted over with iodoform and filled with cotton pledgets packed in with moderate tightness so as to support the cheek and repress the tendency to oozing of blood. The pledgets should be provided with strings, so as to facilitate removal.

The tegumentary flap is brought accurately into place, the wound closed with harelip pins at the lip, and in the rest of its extent with fine catgut or carbolized silk interrupted sutures. The dressing is completed by a compress of carbolized tow or absorbent cotton placed over the wound and retained by a few turns of a bandage. After the second or third day the cotton packing may be removed, and the cavity thoroughly cleansed daily with an antiseptic solution.

Fig. 2979.—Line of Incision in Excision of the Upper Jaw by External Flap. Fergusson's Method. (Erichsen.)

*Results.*—No operation of equal magnitude is followed by as great success as excision of the upper jaw. Erichsen says: "Of 17 consecutive cases collected by Hutchinson as having been practised in the London hospitals, it was successful in 14; and of 16 cases (10 of total and 6 of partial) done by Esmarch, 13 were successful (viz., 8 of the former and 5 of the latter)" ("Science and Art of Surgery," vol. ii., p. 585). In the practice of Prof. W. T. Briggs and the author, of 38 cases of total extirpation of the upper jaw (24 by the former, 14 by the latter) there has not occurred a single death.

The recurrence of the disease, after removal of the upper jaw, depends upon the character of the growth. When the operation is done for the removal of benign

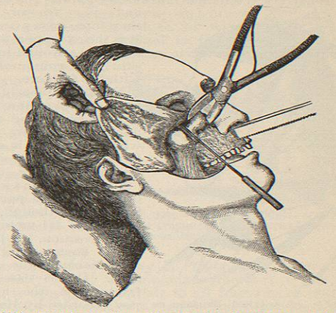

Fig. 2980.—Excision of Upper Jaw by Liston's Method. (Erichsen.)

tumors, recurrence is rare; but when done for the removal of malignant tumors, epithelial or sarcomatous, recurrence is almost invariably the rule, no matter how thoroughly the operation may have been done, though the lapse of time between the operation and the reappearance of the growth varies within wide limits.

Osteoplastic Section of the Upper Jaw is the term applied to an operation devised by Langenbeck, in 1859, for the removal of tumors situated behind the upper jaw but not involving that bone. The operation consists of the division of the attachments of the jaw in such a manner that the bone can be displaced downward or to the outer side sufficiently to expose tumors growing from the sphenoid or ethmoid bones, or from some of the fossæ between these bones and the palate bone. After removal of the tumor the jaw is replaced in its normal position, so that union of the divided bones will take place. The operation has been performed a number of times, with gratifying results, both in this country and in Europe.

Removal of Both Upper Jaws.—Excision of both upper jaws was first successfully performed by Heyfelder in 1844, since which time the operation has been occasionally repeated. It may be performed by carrying incisions from each commissure of the lips to the external angles of the eyes on both sides, and reflecting the flap, together with the nose, upon the forehead. The bony attachments of the jaws, the malar processes on each side, and the junctions of the bone with the nasal bones and vomer, are divided with the saw and forceps. The bones are then grasped with lion forceps and forcibly wrenched from their position.

### Injuries and Diseases of the Lower Jaw.

The principal injuries and diseases of the lower jaw are dislocation and fractures, abscess, periostitis, necrosis, and the various kinds of tumors.

Dislocation of the Jaw.—This accident, not infrequent in middle age, is rarely met with in the extremes of life. It occurs more commonly in women than in men. Though in the majority of cases bilateral, the dislocation may be confined to one side.

As the subject is treated under the heading *Dislocations*, in volume III., it will not be necessary for me to enter into further details in this place.