the common Mole, a complete study of the earlier stages of the mandibular arch yields the following results. In the Mole (*Talpa europæa*), which has, in the adult, extremely small ossicula auditus, the embryonic mandible is as large as in the Sauropsida; the top of the bar forms a very distinct quadrate lobe, and there is below a short posterior and a long internal process. The rod then runs on, thick and solid, inside the thickening tissues which form the ramus, together with the internal branch of the third division of the fifth nerve and the chorda tympani from the seventh on its inner side, and the outer branch of the third division of the fifth on its outer side. The two Meckel's cartilages meet, unite, and form a basi-mandibular rod, which, however, does not become segmented off.

The tissue outside Meckel's cartilage becomes differentiated into a large superficial plate of cartilage, and outside this, a thin bone, the dentary. The latter rapidly ossifies all the cartilage, except the posterior angle, and the ascending articular process: part of this cartilage lines the glenoid cavity of the squamosal, part forms the meniscus, and the rest remains as the articular condyle. The angular process soon becomes ossified.

Subdistally, Meckel's cartilage ossifies for a considerable extent as a hyo-mandibular, and then coalesces with the dentary. There is also a bony tract inside Meckel's cartilage, which is only partially distinct, and represents the splenial and coronoid of the Sauropsida. Proximally, the thick knob and the broad part giving off the two processes become ossified endosteally, a separate centre being formed in the internal angular process of the cartilage.

A splint of bone, the mandibular *ectosteal* articulare, appears at the same time, and then all the three centres coalesce. Also, in the tract close to the articular head of the ramus, there is another bony splint, which partly gives off from its edge (behind) another smaller piece; these two subdistinct rudiments have all the characters and relations of the supra-angular and the angular of the Sauropsida.

In Ornithorhynchus, the splenial is much more distinct than in the Mole, and it has a well formed thick crest, half-separate, answering to the coronoid of the Sauropsida. In other mammals, including Man, the ectosteal articulare is the only posterior splint, and it is early fused with the ossifying cartilage.

In half-grown Moles, the hinder splints—supra-angulare, angulare, and articulare externum—form a very remarkable crested, ridged, and laminated structure; but, in the adult, all this has been absorbed, and the small process gracilis is all that is left of these growths. On the outside of the membrana tympani, which is stretched by the internal angular process of the mandible—the manubrium mallei—a superficial crescent of cartilage, and a still more superficial crescent of bone, appear. In many kinds, these fuse early; in Carnivora, the bone unites with the cartilage after it has ossified; it does not in the lesser Bats.

The ridge inside the permanent malleus is for the tensor tympani, and answers to such projections inside the articulare of Sauropsida as are for muscular attachment of its adductor.

In the Monotremes, the malleus remains large, and the incus is very rudimentary; in these and in several other kinds of low Mammals, the hole in the stapes is either absent, or very small; and thus the latter more nearly resembles the shaft of the columella of Sauropsida. The tympanic bone is nearly straight, having only a spike behind, and it thus does not form a ring. This bone is evidently the counterpart of the interopercular of fishes, as the cartilage is a low-placed opercular ray of the mandible.

In conclusion, it may be remarked that in this part of the organism, as in every other, embryology fails to give the slightest hint of the chasm which ultimately exists between Man and the most anthropoid of the remainder of the Mammalia.

THE FARRINGTON GENERAL DISPENSARY.—The presidency of this old-established institution, which became vacant by the death of Lord Hatherley, has just been accepted by Lord Coleridge. At the annual meeting, held last month, it was stated that 32,000 patients had attended the institution during the year, and the medical staff reported that these patients appeared to be of a deserving class, and that they did not believe that the charity was in any way imposed upon. On the 30th of last month an amateur dramatic performance, in aid of the funds, took place at St. George's Hall. A full audience witnessed an exceptionally good representation of "Masks and Faces," and the funds of the institution will receive about £50 profit after the expenses incidental to the performance have been paid.

PRESENTATION.—Mr. A. E. Chesshire, one of the surgeons to the Wolverhampton Eye Infirmary, has been presented by about seventy of his patients with a testimonial, consisting of a silver-mounted spirit-flask, a surgical basket, and a silver sandwich-case.

ANTISEPTIC INCISION AND DRAINAGE IN EMPYEMA.

By F. RICHARDSON CROSS, M.B., F.R.C.S.,

Surgeon to the Bristol Royal Infirmary.

AN effusion into the pleura, which by its amount and by the rapidity of its increase is threatening the life of the patient, should be at once tapped. The displacement of organs, to which the serious symptoms are due, must be relieved by removal of the displacing fluid. Even hydrothorax dependent on cardiac or renal disease demands interference, although the dropsy of the pleura is almost certain to reaccumulate. Goldammer, of the Bethany Hospital, Berlin, has by puncture given relief in fifteen cases of secondary effusion without ill result; and even hæmothorax must not be always left alone.

A rapidly increasing pleurisy may cause fatal syncope by interference with the circulation. Bartels has found, in cases of left-side exudation, the inferior cava, where it passes through the quadrate hole of the diaphragm into the thorax, bent at right angles by displacement of the heart. This would be followed by stasis of blood in the lower half of the body, and consequent anæmia of the heart or brain. Fraentzel adds that he has never seen fatal syncope with right-side effusion. Leichtenstern, analysing fifty-two cases of sudden death with pleurisy, finds thirty-one to be in right-side exudations. He attributes death to pressure on the right heart, with thrombus here or in the superior cava, and embolism of the pulmonary artery.

Other pleural effusions, which do not *per se* threaten the life of the patient, should be treated medicinally; but, if absorption through the natural channels do not follow within a reasonable time, the chest should be tapped to relieve the bruised and compressed lung, and to allow its early and complete re-expansion. In pleuritis, the withdrawal of only a few ounces of fluid lessens the intrapleural pressure, reopens the blocked lymph-channels, and is rapidly followed by absorption of the remaining excessive secretion. Besides, removal of irritation from the pleura lessens the tendency to chronic inflammation and hyperplasia in the tissues of the membrane itself, or its consequent hypertrophy, and the formation of adhesions, which bind down the compressed lung, and render it liable to phthisical degeneration and fibroid change. Every day that the effusion continues, the full re-expansion of the lung—without which, no case can be looked upon as cured—is rendered less probable, and its permanent incarceration by the thickened pleura more certain. If the fluid is to be removed by puncture through the chest-wall, the diagnosis may be rendered more certain, and the character of the fluid be demonstrated, by the use of the hypodermic syringe.

Although no harm seems to follow the admission of air to an acute or dropsical serous effusion, suppuration would thus be induced in the subinflammatory exudation of strumous individuals; whilst, if the fluid be pus, its contact will cause fetid decomposition. Most of the methods for paracentesis thoracis, therefore, prevent any entrance of air into the chest; and, whilst excluding it and other putrefactive agents from the more or less putrescible pleural effusion, they encourage expansion of the lung by tending to reduce the intrapleural pressure below that of the atmosphere within the air-cells of the lung. A trocar and cannula with air-tight valves, or subaqueous drainage, effect the purpose; and the aspirator is still more powerful as exerting considerable suction. Whatever instrument is used must be *surgically clean*, especially where it lies within the chest; and it must be *air-tight* here, as well as in its own valves. Its reliability is most tested towards the end of the operation, as the expansion of the lung and the compression of the structures bounding the thoracic cavity reach their limit.

In *rapid tapping* for sero-fibrinous exudation and dropsy, no attempt need be made to empty the pleura of fluid; nor could this often be effected; for, besides the fear of wounding the lung, cough and pain usually occur before its full re-expansion; and partial removal of fluid is thoroughly effective. If the fluid be pus, clinical experience abundantly proves that no method of rapid tapping will effect a cure, and that the pleura must be continuously and thoroughly drained. Exception to this statement must be made in the case of children; here, an abnormal pleural effusion is usually pus; often it is small in quantity; very rarely it may be absorbed; and not unfrequently it will disappear under one or more rapid tapplings. If not so, the child as well as the adult must be treated by *continuous drainage*, at an opening of the chest made with every consideration to conveniently and effectively empty the pleura. For, whether an empyema be repeatedly treated by rapid air-tight tapping or left entirely to nature, in process of time—during which the lung is being permanently compressed, the pleura irritated by its contents, and the patient worn out by dyspnoea and

fever—the pus will make its escape by the lung, or more probably through the thorax in front, close to the sternum, where the absence of the external intercostal muscle leaves the chest-wall thin. The relief thus given to the symptoms of retention of pus is soon replaced by suppurative fever or hectic; for the pleural contents, exposed to the action of the atmosphere, undergo foetid decomposition, which spreads into the serous membrane itself. Many such cases, however, recover with the lung permanently injured, with contraction of the chest-wall and lateral spinal curve, to which is usually added a constantly discharging sac of putrefying pus.

It is important here to remember that an empyema may be localised or even sacculated. Such cases usually result from caries of a rib or ulceration of the thoracic wall, or from a similar morbid process in the remains of a pleuropneumonia. Dr. Wilks has said: "If, under any circumstances whatever of an inflammatory attack in the chest, under whatever name that attack may be called, there result localised dulness with absence of breath-sounds, and perhaps distant tubular breathing, an empyema may be safely suspected." He has seen five cases of such localised empyema in one year fatal by bursting into the lung, and recommends that, if a single tapping do not cure them, they should be treated by free incision.

In all cases of local or general empyema, free incision, without any special precautions, should give better results than those left to natural processes, because the cases are earlier relieved, and the opening is made convenient for effective drainage. Dr. Fuller, in 1872, had seen no fatal cases treated under him by this method since he had been connected with St. George's Hospital. But a free incision soon heals, until it is merely a narrow sinus through the chest-wall, not large enough to allow free escape from the pleura. The pus collects, and, by reflex irritation of the pleura, is soon largely increased in amount. This tendency can be perfectly met by the use of Chassaignac's drainage-tube. No counter-opening is necessary, the original incision being always at the best available site for drainage. The end of the tube should reach any pocket of pus that may exist.

In cases of fistula remaining after escape of empyema, a properly arranged system of drainage through the fistula, or by a more advantageous counter-opening if necessary, will often effect its closure. Syringing is useful in these cases, not by rendering the sinus antiseptic, but by helping to dislodge the offending matters which escape, whilst the comparatively innocuous injection dilutes or replaces them in the pleura. In recent acute cases, syringing does harm; it irritates the pleura, causes increased continuance of the effusion, and may even produce a fatal result from shock. One of my cases, treated by good drainage under Listerian precautions, and which was perfectly cured, after the removal of the drainage-tube on the fifteenth day, had to be re-dressed each day for the first nine, as I now think by reason of the syringing that I (officially) used causing excessive secretion. With properly arranged drainage, syringing should not be necessary; but if the discharge continue for a long time purulent, and bagging be suspected, it should, I think, be carefully used to flush out the pleura, and the necessity or otherwise of its further employment will be indicated by the character of the fluid that escapes after its injection.

Some cases of old-standing fistula may be prevented from filling up by rigidity of the thorax, or fixation of the viscera, preventing apposition of the pleural surfaces. I believe that, with proper drainage, assisted, if necessary, by syringing, this will rarely occur; but if it do, resection of a piece of one or more ribs will permit falling in of the chest-wall, and tend to closure of the sinus. Such a proceeding is quite uncalled-for at an early period.

Good drainage is the essential consideration in the treatment of empyema, but there is another side to the question scarcely less important—the prevention of putrefaction or of foetid decomposition in the pleural contents. So long as pus is contained within its abscess-sac, it does not putrefy; but putrefaction is immediately brought about by contact of putrefactive agencies abundant in the outer world, or in the mucous tracts of the body immediately in communication with it. Pasteur's experiments show that the putrefactive elements are not the gases of the atmosphere, but solid particles floating in it, as well as abundantly present on the surface of the planet. Air itself would harm the pleura by physical or chemical contact, but its exclusion is a matter of very small importance, provided the vital putrefactive agents in it be excluded.

I should prefer to treat an empyema by absolute exclusion of air, if this could be satisfactorily combined with continuous drainage; but I do not think it practicable; for the granulation-tissue which must develop around a tube passed through the intercostal tissues secretes pus, and thus provides a putrescible channel between the pleural contents and the atmosphere; and if ulceration occur instead of granulation, the tube-tract in the chest-wall is no longer even air-tight. The

difficulties in the way of emptying the pleura without admitting anything to replace the discharging pus, and the doubtful usefulness of any form of traction to encourage the expansion of the lung, militate still further against prolonged aspiration or any form of continuous suction. On the other hand, atmospheric pressure in the pleura directly upon the lung does not seem to interfere with the ultimate expansion, and, provided the putrefactive agents be destroyed, the presence of air is scarcely prejudicial. I, therefore, submit that the most satisfactory way at present of treating empyema is by a free dependent opening into the pleura, with good drainage, under full Listerian precautions, which allows free and full escape of the pus, and admission into the pleura of an aseptic atmosphere until such time as the visceral and parietal pleurae come into contact.

As to the site for drainage, the most dependent part of the pleura, when the body is supine, is the tenth rib at its angle. An incision made along its upper border, just outside the angle, is as low in the chest as it is usually safe to go. The lower intercostal spaces are widest, and posteriorly more so than at the axilla, admitting a full-sized drainage-tube. The lower angle of the scapula rests on the eighth rib, I should incise just outside the angle of the rib, never above the eighth space; and if the effusion be very large, should prefer the tenth.

The drainage-tube requires careful management. If it be left in too long, the sinus cannot close; and, even if the empyema be practically cured, the granulation tissue along the tube secretes a good deal of pus. On the other hand, it should not be withdrawn too soon. In one of my cases I thought it produced dyspnoea, and unwisely withdrew it the second day after the operation, but reintroduced it two days afterwards, with relief of a great deal of pus. On the seventh day after the operation, the empyema was replaced by a serous discharge, and I again discontinued the drain; the wound did not heal until seven weeks after the operation. Had I drained for a fortnight, I believe it would then have been cured in a third of the time.

One of my cases, a girl aged 17, despite syringing, had recovered from an empyema of one month's standing a fortnight after treatment. The second, 2 $\frac{3}{4}$ years old, who was relieved of three pints of pus about a month after the commencement of her illness, and the wound healed in seven weeks, despite imperfect drainage. (Both these occurred in the practice of my friend, Dr. Shingleton Smith.) The younger patient I saw two months after the operation. She was absolutely well in every respect, and the assumption is that the other case, which was only under treatment a fortnight, is also perfectly well.

A female, aged 18, with stiff contracted joints, cardiac mitral disease, and old strumous sinuses over the sternum, on the shoulder, and in the armpit, which had resisted all attempts at treatment, showed, early in 1881, symptoms of left-side pleurisy. In course of time, it seemed evident that she was suffering from empyema. Dr. Fyfe considered with me the advisability of operating. I was afraid to open the pleura, on account of the contiguity of the septic sinuses on the chest. I did not care to aspirate, for I thought that would only hasten the necessity for free incision. The general condition of the patient seemed to promise no hope of recovery, and she was in no immediate danger. By-and-by abscesses appeared at the cardiac apex in front, and one in the lumbar region behind. It was like a psoas abscess, threatening to burst. Antiseptic treatment gave the only chance, and I decided to pass a drainage-tube through the abscesses and through the chest. Before doing so, I carefully scraped and swabbed, with De Morgan's solution of zinc chloride, all the sinuses, padded each separately with carbolic gauze, and took every precaution to prevent the ends of the drain being inoculated from them. On the evening of the day following the operation the patient seemed sinking, but after two days of sharp reaction she continuously did well. On the seventh day I got rid of the anterior part of the drain, and allowed the chest here to close. On the fourteenth day the advantage of free drainage was well exemplified, a plug of fibrin blocked the tube, and as withdrawn by the change of dressing, allowed a free outflow of perfectly clear serum. At the end of four weeks I kept the posterior drain only under the special antiseptic dressing. The axillary sinus throughout was foetid, the others were perfectly free of smell. The drain was removed entirely early in the sixth week, and the wound had healed at the next dressing. The discharge was serum, not pus, after the first few days. Syringing was used only on one or two occasions. I may add that all my cases of empyema have got well in a way analogous to ordinary primary abscess.

M. GAUTIER presented to the *Académie de Médecine*, at a recent sitting, a ptomaine in a perfectly pure condition. It was a very caustic, oily liquid, and extremely venomous, almost as much so as the venom of the cobra. A milligramme and a half inserted under the skin of a bird killed it in less than an hour with paralysis and tetanic convulsions.