PULSATING EMPYEMA

(EMPYEMA PULSANS)

BY

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EMPYEMATA may pulsate, but distinct pulsation is certainly a very rare phenomenon. When Comby¹ wrote his paper in 1882 he did not succeed in finding more than about thirty cases recorded.

Wilson² in 1893 brings up the number of published cases to sixty-eight, but the increase in numbers of recent years is chiefly due to the larger number of cases recorded in which there has been a general shock, more or less distinct, felt over a considerable area of the side.

The fact remains that distinct pulsation is very rare, but the condition is one which always attracts attention, on account of the difficulties of diagnosis to which it may give rise.

The pulsation is of two kinds :—(1) A general shock or impulse communicated to a considerable area of the chest walls. This has been called intra-pleural pulsation. (2) Expansile pulsation localised in an external tumour. This has been called extra-pleural pulsation.

¹ 'Arch. gén. de Méd.,' Nov., 1883, "Thésis d'empyème pulsatile."

² 'Trans. Assoc. Amer. Phys. Philad.,' 1893, viii, 195.

The pulsation is sometimes visible, but often only to be felt by the hand. It occurs, with but few exceptions, on the left side ; thus of sixty-six cases it was on the right side in five instances only.

The pulsation is synchronous with the heart, and almost invariably systolic in time, though there are three cases in which it has been stated to be diastolic ; two recorded by Macdonald¹ and one by Stokes.²

The condition may be met with in either sex, and at any age. It is more common in males, in the proportion, it appears, of four to one, and in adult life between the ages of twenty and thirty-five. The youngest recorded case was two years, and the oldest fifty-seven. It is rare except with empyemata, and then only with those of long duration ; but it has been described also with serous effusion and with pyo-pneumothorax.

Intra-pleural pulsation.—When the pulsation is intra-pleural it is occasionally visible, but usually only to be felt by the hand. Usually it is widespread and felt over the lower part of the chest, especially in the axilla, as the patient is lying in bed. Occasionally it is felt higher up and more in front. It may be limited to one or two intercostal spaces in the supra-mammary region, or be more diffuse and extend outwards from the sternum to the middle, or posterior, axillary line, and downwards from the third rib to the lower part of the axilla. In these cases, especially where the pulsation is felt high up, it is probably analogous to that which is felt in the abdomen in ascites, and partakes of the character of a fluid wave.

Intra-pleural pulsation may occur with any kind of effusion, chiefly, it is true, with empyema, but also with pyo-pneumothorax, and sometimes even with serous effusion. Of this latter Traube³ recorded the first case, and several others have been described in recent years.⁴

¹ 'Dubl. Journ.,' 1854, xxv.

² 'Dis. of Heart and Aorta.'

³ 'Ges. Beiträge,' 1871.

⁴ Fraentzel, Ziemssen, iv, 2nd, p. 355.

Extra-pleural pulsation.—Extra-pleural pulsation, *i. e.* pulsation limited to an external tumour, is met with in empyema only. It occurs when the empyema is pointing, and if the empyema is pointing in more than one place, may occur in two or three of the tumours. Thus, of the cases recorded, in three instances there were two, and in two instances three, external tumours, all of which pulsated.¹

In many of these cases the tumour and the pulsation in it may vary with respiration, the tumour becoming larger and the pulsation more distinct with expiration, and less so with inspiration. Sometimes both the tumour and the pulsation in it may be made to disappear by pressure, that is to say, the pus may be returned within the thorax.

These pulsating tumours may be met with in any part of the chest where an empyema points, but most of them somewhere near the heart, and of course this will be their most likely position if the empyema is localised. Thus they may occur above the præcordial region, but are found more commonly in the mammary region or near the apex, and occasionally even immediately over the præcordium in front.

Where there is more than one tumour they are usually close together, but they may be widely separated, *e. g.* one tumour may be near the heart and the other close to the spine (Macdonell, Wilson Fox).

Occasionally, if the empyema has tracked, a pulsating tumour may be found in a very unusual place, *e. g.* in the loin. Thus Owen Rees² records a case in which the empyema tracked to this spot, and the post-mortem showed that it was due to an empyema; the pulsation in this case being transmitted, not from the heart, but from the abdominal aorta, with which the abscess was in close relation. A similar case is recorded by Müller.³

Diagnosis.—The diagnosis may be very difficult, but the difficulties are not quite the same in intra- and extra-pleural pulsation.

¹ Wilson, *loc. cit.*

² 'Brit. Med. Journ.,' Aug. 21st, 1858.

³ 'Berl. klin. Wochenschr.,' Jan. 22nd, 1872.

Intra-pleural pulsation does not, as a rule, present any great difficulties, for it is rarely met with except with large effusions, and then the nature of the case is evident. If it should be limited, however, to the anterior part of the chest or to the region of the heart, it might need to be diagnosed from a dilated or hypertrophied heart on the one hand, or from an aneurism of the heart or of the aorta on the other. It is not, however, in these cases that the difficulties occur, or if they do that they are of any great practical importance.

The association of the two conditions, viz. of a pulsating pleural effusion with an aneurism of the aorta, is very rare. I only know of one instance, viz. that recorded by Stokes,¹ and in that case the aneurism was very small.

The diagnosis from pulsating pneumonia and a pulsating intra-thoracic new growth, as suggested by Graves, is very unlikely to make difficulty, for these cases are, to say the least, extremely rare. I have never seen a marked instance of either. As to the existence even of pneumonia pulsans I am very sceptical.

With *extra-pleural pulsation*, i. e. pulsation in an external tumour, the difficulties are also not, as a rule, great, for the physical signs indicate the existence of a large empyema which is pointing.

If the empyema be localised, especially in the neighbourhood of the heart, the difficulties of diagnosis may be greater. If the tumour is near the apex of the heart or over the lower part of the præcordial region, the question of cardiac aneurism might arise; yet aneurisms of the heart hardly ever cause an external tumour in this position. They develop rather in other directions within the thorax. I have, it is true, seen one case of cardiac aneurism causing an external swelling. This occurred on the right side of the chest, between the nipple line and the lower part of the sternum, but there was no doubt about the diagnosis.

Where the swelling is higher up, and especially if it be in the first and second intercostal spaces, the chances of

¹ Loc. cit.

aneurism would be greater. Thus, in Topham's¹ case, in which there was a pulsating swelling in the third intercostal space close to the sternum, an aneurism was diagnosed, and the patient was kept in bed for about three years, when a discharge of pus took place, the tumour disappeared, and the patient got well.

In Aran's² case an abscess in the upper part of the mediastinum caused an external swelling. This was not connected with the pleura. It discharged, and the patient recovered. And in Vidal's³ case a similar pulsating swelling over the lower part of the sternum proved to be also due to a small abscess in this position; but this patient was suffering from double empyema, though no direct communication could be traced between the mediastinal abscess and the pleura.

Localised empyemata in the neighbourhood of the heart are very rare, and even when they occur do not often cause external pulsation. In a remarkable case in which the empyema was on the right side of the chest between the sternum and nipple, so that the dulness was continuous with that of the heart, though the empyema was in close apposition with the right side of the heart there was no trace of pulsation communicated externally. On the other hand, even when the tumour is due to an aneurism, it need not necessarily pulsate, for the interior may be filled with clot.

The difficulties of diagnosis are greater between a local abscess of the chest wall which pulsates, and an aneurism, than between an aneurism and an empyema, because, in the majority of cases, the signs of empyema are so characteristic.

Superficial abscesses are most likely to give difficulty when they are seated somewhere near the apex of the heart, where the pulsation is forcible and the intercostal spaces fairly large, and they are still more likely to pulsate if there be pus beneath the ribs as well as outside

¹ 'Lancet,' 1878, i, p. 756.

² 'Bull. de Soc. Méd. des Hôpitaux,' 1858, xv, 90.

³ 'Bull. de la Soc. Anatom.,' 1854, p. 243.

them, as, for instance, with a periosteal abscess due to caries of a portion of the rib in this position. I have seen one instance of this kind in which the pulsation was so marked that no one dared to interfere with the tumour. Ultimately the skin burst, pus was spontaneously discharged, and the tumour entirely disappeared.

I think, in cases of this kind, a small puncture with a very fine needle, for the purposes of exploration, would do no harm whatever, even if the tumour proved to be an aneurism, and of course it would at once clear up the diagnosis if pus was obtained. Over such a tumour a murmur would not, as a rule, be present, as it might be in the case of an aneurism; but then a murmur is not necessarily present even if the tumour is aneurismal, and, as stated, some of these external aneurisms do not even pulsate.

Explanation.—Pulsation being, as a rule, absent in effusions of all kinds, of whatever size they may be, it is evident that its occurrence requires peculiar conditions. There appear to be three different kinds of pulsation, and the same explanation will not fit them all.

1. There is, first of all, the general shock felt over the lower part of the chest, usually in the posterior axilla and behind. This is found only with very large effusions, and necessitates considerable intra-pleural pressure. It is the same thing as the general shock which is transmitted sometimes to the chest walls, from the heart through a solid mediastinal or pulmonary tumour, or through massive pneumonia.

2. There is next that form of pulsation which is met with chiefly in front, and in the upper part or mammary region of the chest, and which does not, as a rule, extend beyond the anterior or mid-axillary line. It is to this group that most of the recently recorded cases appear to belong. This kind of pulsation is, I think, strictly analogous to that which we meet with in the abdomen in ascites, and is due to the propagation of a fluid wave from the heart to the surface of the fluid. It is felt where the surface of the fluid would be as the patient is lying in bed

upon the back, and would, I think, very likely alter its position if the patient sat up, though I do not know that this has been actually described. As in the abdomen it is to be connected with a certain laxity of the chest walls, for fluctuation is not nearly as distinctly felt in the abdomen when the walls are tense as when they are relaxed. For this reason this form of pulsation occurs usually with empyemata, and with empyemata of some duration, though it might possibly be met with in other forms of effusion, and also with pneumothorax.

3. In the third form of pulsation, viz. that in which the pulsation has more of an expansile character, whether it be felt over a large portion of the chest or limited to an external tumour, the explanation, I think, is different.

This last kind of pulsation is more like that which we get in a large abscess, and which we speak of as "surgical fluctuation;" and in order that this should be obtained the fluid must be contained within some more or less resistant walls, *i. e.* must be under some pressure.

Wherever there is a large collection of fluid in the pleura, on the left side especially, it is obvious that the pulsations of the heart must affect it; but in most cases the pulsations spend themselves upon the least resistant part of the abscess walls, viz. upon the incompletely collapsed portion of the lung or upon the mediastinum, or if pneumothorax be present they exhaust themselves in compressing the air in the pleura.

In order that the pulsation should be transmitted distinctly to the chest walls or to an external tumour, it is necessary that the other parts of the walls of the pleura should be rigid and resistant, so as to enable the pulsations to be transmitted to the thoracic walls, *i. e.* to what are usually the more resistant parts. In the case of a general empyema, *i. e.* of an empyema occupying the whole pleural cavity, this kind of pulsation presupposes the rigid fixation of the internal walls, viz. of the heart and mediastinum, and of the lung also. This is exactly the condition which has been on many occasions described.

Of this Comby's case is a good instance. On post-mortem examination the heart was found to be rigidly fixed to the right side of the chest, and the lung to be adherent all along the mediastinum from the sternum to the spine, as well as at the apex, and to be in a condition of extreme fibroid induration. The empyema in this case was a large one and the pulsation distinct; 80 oz. of pus were removed, and the pulsation disappeared, until the fluid re-accumulated, when it returned.

For this kind of pulsation, therefore, we require that the internal walls of the pleura, the mediastinum, and lung should offer almost as much resistance to the pulsation of the heart as the chest walls, and such conditions are not likely to be common.

Where the empyema is pointing, that is to say, where the pus has made its way through the chest walls, and there is a fairly free communication with the pleura, the resistance is very much less, and we should expect, *a priori*, that pulsation would occur in these conditions much more frequently. This we know to be the case, for this kind of expansile pulsation is met with most frequently with external tumours, that is to say, where an empyema is pointing.

In the same way, where the empyema is localised pulsation of this kind necessitates considerable induration of the walls surrounding the abscess, and probably a considerable amount of intra-pleural pressure.

These cases are interesting chiefly on account of the difficulties of diagnosis, but the diagnosis once made the treatment is that of empyema, *i. e.* they may be tapped or opened as may seem desirable, and with success.

It has been stated that pulsating empyemata are, almost without exception, fatal. This is an over-statement of fact, and is far from true. Thus, in Wilson's cases, out of forty-six in which the result is stated, twenty-four recovered, *i. e.* about 52 per cent.

The cases which are generally fatal belong to the last group which has just been described, viz. that in which

there is expansible pulsation of a very marked kind. These cases are fatal, not because the empyema pulsates, but because of the peculiar conditions, viz. the fixation of the heart and the changes in the mediastinum and lung, which prevent cure. Of the other cases the great majority recover.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. ix, p. 104.)