

THE OCCURRENCE OF SUBCUTANEOUS EMPHYSEMA IN LABOR.

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This condition must be considered as one of the rarer accidents occurring during labor if we are to judge the question by what has been written on the subject, for only a comparatively small number of case reports are to be found in the literature, and an estimate which has been ventured by certain observers places the frequency as one in about 2,000 labors. Probably the complication occurs more often than this, but as it may pass off without appreciably marked symptoms, an emphysema of this kind, unless extensive, may readily enough escape the attention of the accoucheur. Most text-books omit all mention of the question or dismiss it in a few lines. Hirst refers to a subcutaneous emphysema as a complication of labor and ascribes it to a rupture of the larynx or trachea. He states that in such cases where the condition is largely superficial the prognosis is favorable, but where a rupture of the pulmonary vesicles occurs with air in the sub-pleural or interlobular connective tissue, and consequent cardiac and pulmo-

nary embarrassment, the outlook is more serious. Fortunately in almost all of the cases which have been reported, the condition has subsided within a short time, and in many cases there were very few subjective symptoms.

Just from what point and for what precise reasons the air leaves the respiratory passages and finds its way into the subcutaneous cellular tissues, must still remain a matter of speculation, for all that we have to guide us in the matter are clinical observations; no direct anatomical findings are available. The case here reported can furnish no additional information, but in connection with the series of brief reviews of the other cases found in the literature, it is hoped that some conclusions can be drawn from a consideration of their essential features. I am indebted to Dr. A. B. Davis, in whose service at the Hospital this labor occurred, for the privilege of presenting this case. To Dr. Burdick, house surgeon at the time, I am also indebted for the details of the



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PLATE XI.
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patient's history.

F. O., age 16, primiparæ, single, native of the United States, applied for admission to the Hospital during her ninth month of pregnancy on October 3d. A physical examination at that time disclosed nothing of particular moment. The girl appeared healthy and fairly well nourished. The external conjugate measured 19 cm., the obliques 22.50 cm., the true conjugate 10 cm. The soft parts were quite rigid and the vagina small. On November 8 the girl went into labor, vertex presenting, right occiput posterior. Nineteen hours were required for complete dilatation, the pains being strong and frequent, without being fully effectual as the membranes had been ruptured early in the first stage. The occiput rotated slowly to the front, and after the head descended to the perineum no further advance took place, although the pains were fairly strong. As the fetal heart sounds became slow and irregular, forceps delivery was resorted to and completed without much trouble. The expulsion of the placenta was accompanied by a profuse hemorrhage from the interior of the uterus and a large cervical tear. The latter was sutured with difficulty. A perineal laceration of the second degree was also immediately repaired. The woman had lost a good deal of blood and was considerably prostrated, with a pulse of 164 one hour after labor. Hypodermics of strychnia and ergotol were administered and salines given per rectum and hypodermically with good results. The child weighed 3,850 grams, and was normal in all respects. There was little moulding and no caput succedaneum.

About two hours before the birth of the child a slight swelling was noticed above the angle of the jaw, on the right side, over the parotid, which gave rise to a crackling sensation on palpation. At the end of the labor this area of subcutaneous emphysema had extended over both cheeks, the anterior aspect of the neck, chest and shoulders. The lids were swollen to such an extent that the right eye was closed. There was no complaint of either pain or dyspnoea during this period. There was no change in the local conditions until the second day, when a slight recession of the emphysematous area was noted, and this then gradually subsided day by day until it had entirely disappeared by the ninth day. The face was the first portion to return to its normal state, and the supra-

clavicular region on either side was the last to be freed from the emphysema. During the puerperium the patient showed evidences of marked acute anemia; the blood count on the second day showed 2,350,000 red cells, 45 per cent. hemoglobin, 25,000 leucocytes. On the fifteenth day the red cells numbered 2,920,000, the leucocytes 10,000, and the hemoglobin was 51 per cent. The woman ran a moderately elevated temperature during the second week for several days, there was some foul lochia and the perineal and cervical wounds both sloughed. On December 3 she was discharged entirely well, and with the baby in good condition. A. N. 14508.

The illustration (Plate XI) is from a photograph taken about thirty-six hours after delivery. The pencil line, unfortunately not very distinctly shown, marks the boundaries of the emphysematous area.

The history of this case agrees in the main with those reported below. There was a moderately prolonged dry labor, with considerable rigidity of the soft parts. The straining efforts, as an aid to expulsion, were no greater than usual in these women, and no predisposing cause could be determined for the production of the emphysema, for neither the chest nor the upper air passages presented any abnormalities.

The most extended account of the subject of subcutaneous emphysema during labor is to be found in an article by F. H. Champneys in the *Med. chir. Trans.*, London, 1885, vol. lviii., in which the author calls attention to the fact that the pathology of this condition is mostly guesswork. His paper is an effort to base the etiology of the accident on experimental investigations. Three theories for the production of the lesion have been advanced, it is due either to a rupture of the bronchi, the trachea or the pulmonary alveoli. Champneys found records of but two autopsies, both of French sources, on which to base an opinion. Dupaul describes an interlobular pulmonary emphysema, and Roche also an interlobular emphysema, together with air in the mediastinum. Champneys' experiments were conducted on newly born children shortly after death, the attempt being made to produce an emphysema of the neck without pneumothorax. The straining effort was imitated by putting pressure on the lungs filled with air both within and without the chest cavity.

Air was then forced through a tracheotomy tube, and later was found to have broken through some of the alveoli and out at the root of the lung, behind the pleura and along the great vessels of the neck. It also appeared on the anterior aspect of the chest. A condition of pneumothorax was also present on both sides. In another case where the forcible inflation was practised intermittently so as to imitate the expulsive labor pains, the air was also found to have passed along the root of the lung into the mediastinum as in the other case. Fifteen other bodies were employed in these experiments, but in almost all a pneumothorax was produced. The air, according to these experiments, escaped through a rupture of the lung tissue and produced an interlobular emphysema near the anterior aspect of the root of the lung. This spot seems prone to rupture because there seems to be an inherent weakness at this point, for Champneys found it impossible to rupture either the trachea or the bronchi in his experiments by even the strongest efforts.

Other theories have also been advanced to account for the condition. Thus Watson (*Lancet*, 1905, ii., p. 1360) believes that the air gains access to the submucous tissues in the upper air passages through a lacerated wound of the lips as the result of biting during the straining efforts, and suggests that emphysema of the mucous membranes be looked for in these cases.

A sufficient number of cases of subcutaneous emphysema in labor have been reported in the literature up to the present time, to enable us to form some definite conceptions as to the etiology, symptomatology and prognosis of this condition. Our knowledge of the pathology of this lesion must still remain uncertain, notwithstanding the experimental work to which reference has already been made. The annexed list of cases includes all those of which the original source of publication was available. A few others, principally of French origin, were mentioned in some of the bibliographies, but to these no further references could be found.

An analysis of the seventy-seven cases collected shows that this accident occurs almost exclusively in primiparæ, only one instance of its presence in a multipara being noted. The ages of the patients varied from 17 to 37, but the majority of the cases

occurred in young subjects. The accident seems to be of very infrequent occurrence; for example, at the Dublin Rotunda, Sinclair and Johnston (1858) noted but seven cases among 13,478 deliveries. Most of the writers on the subject refer to this great rarity, although it seems quite possible that slight degrees of subcutaneous emphysema often escape notice. With very few exceptions the labors in all of the patients referred to below were prolonged from early rupture of the membranes, rigid soft parts or some form of pelvic contraction. The condition may not be associated, however, with a tedious or difficult labor, as a few of the reported cases will show.

The phenomenon occurs in varying degrees of severity. As a general thing a swelling is first noticed in some part of the face, which comes on suddenly during an expulsive effort. In some instances the emphysema was stated to come on shortly after labor. Very often there is present a sense of thoracic discomfort or a feeling of suffocation, or the patient exclaims that her vision is interfered with. Examination then shows a puffy swelling of the cheeks or eyelids which gives rise to the characteristic crackling sensation on palpation. In other cases a swelling first appears on one or the other side of the neck, usually between the sternomastoids and above the sternum, leading to a complaint of pain and stiffness. The face may be red and then become markedly cyanotic. From the face or neck the emphysema may spread upwards to involve the forehead and even the scalp and downwards to include the anterior and posterior aspects of the chest, abdomen, back and arms. The affected areas are usually the site of painful sensations. In a number of instances the mucous membrane of the mouth has also been found to be the site of emphysematous patches, and for this reason it has been assumed that in these cases the air entered through some defect in this tissue. Dysphagia may be present in a varying degree. Cough and dyspnoea are observed in a large number of cases, together with an increase in the pulse rate. A noteworthy exception to the latter appears in the account of a case by Neu (q. v.), where a marked and persistent brachycardia was present. Hoarseness may also be very pronounced, showing that the vocal cords are involved in the process.

What we know of the pathology of this condition has already been discussed above. The prognosis is

good, the emphysema subsiding at varying periods of from a few days to several weeks. Aside from a few indefinite symptoms in some of the cases, it does not appear to leave any after-effects, and in those patients where subsequent labors are noted, the accident is stated not to have recurred.

The treatment of this condition is largely symptomatic and expectant. In the early days, venesection was resorted to and the emphysematous areas were also incised. In the average case it seems scarcely necessary to do anything more than to keep the patient quiet after the labor has been completed and then to have avoid all efforts at straining. Where the emphysema spreads rapidly, however, and is accompanied by considerable cough, dyspnoea and dysphagia, assistance is indicated and the patient should be delivered as soon as possible.

The following brief abstracts of cases of subcutaneous emphysema occurring during or after labor, are believed to include all those reported in medical literature, with the exception of a very few to which no original reference could be found.

BLAGDEN. *Medical Facts and Observations*, 1791, vol. ii., p. 45.

Primipara, age 25, small in stature, with a pelvis of the male type having a narrow pubic arch. The soft parts were very rigid and the child was not born until seven hours after complete dilatation. The pains were very severe. At the moment of delivery the patient was suddenly seized with a sense of suffocation, and the face and neck were found to have become emphysematous. She was bled with relief. The eyelids were very much swollen, and the eyes remained closed until the fourth day. The emphysema disappeared within a week, all except a small area under the clavicles and the arms, where it could be felt for many weeks. The three subsequent labors were likewise severe and tedious but no emphysema developed.

CLOQUET, JULES, *De l'influence des efforts sur les organes renfermes dans la cavite thoracique. Memoires*, 1820, p. 34.

Primipara, age 23, was in the second stage more than four hours during which the pains were most severe. During one of these expulsive efforts a swelling was noted between the sterno-mastoid muscles just above the sternum, which extended rapidly upwards towards the parotid regions and then involved both cheeks and eyelids, so that in fifteen minutes the

division between face and neck was indistinguishable. Marked dyspnoea was present at the time. An asphyxiated child was born, which soon died. A small incision was made into this emphysematous area, over the sternum, through which some blood and air was released. As no diminution in the size of the swelling took place another incision was made two days later, after which the greater part of the emphysema subsided. Crepitation was still evident around the clavicles seventeen days later, and complete recovery did not take place for several weeks.

Cloquet states that this patient had a contracted pelvis, and as she was unable to walk for three months after delivery, and complained of severe pains in the region of the symphysis pubis, it is probable that a rupture of the latter may have occurred. The dyspnoea was very severe in this case, and continued for several days. Cloquet thinks that a rupture of the trachea took place in this instance just above the bifurcation of the bronchi.

DUTTON, R., *Amer. Med. Recorder*, vol. v., 1822, p. 511.

Primipara, age not stated, with rigid soft parts. Her labor was prolonged and severe. During the second stage she suddenly complained of a sharp pain in the chest under the sternum, which radiated around to the right shoulder. A swelling then appeared on the right side of the neck and face, which closed the right eye. The labor was terminated with forceps. There was great dyspnoea after delivery, the swelling extended even further over the face and neck, down the chest to the last rib and over both arms. There were no further symptoms, and the patient entirely recovered in a few (?) days.

CAMPBELL, M., *Edinburgh Journal of the Medical Sciences*, April, 1826.

A strongly built woman with her first child had a prolonged painful labor marked by slow dilatation of the os. The head became fixed at the inlet, and it was another day before the woman delivered herself of a dead child. Several hours after labor, a swelling was noticed over the neck and face, which gradually extended over the entire body, the crepitation being marked even where the swelling was less pronounced. The patient coughed and complained of a feeling of oppression in the chest. In a few days the condition disappeared.

(The delay in the labor in this case was probably due to a contracted pelvis.)

MENIERE, *Archive de medicin*. 1829, March.

A report of three cases, all primiparae, aged 35, 37 and 29 years, and in delicate health. The labor in

each instance was prolonged and difficult owing to rigid soft parts and large fetuses. There were no subjective symptoms, and the swelling in each case involved only the area between the sterno-mastoid muscles, the face not being affected. Within three or four days a complete recovery resulted.

BLUNDEL, *Principles and Practise of Obstetric Medicine*, London, 1840.

The author of this book refers to case of emphysema occurring during labor in describing rupture of the trachea or bronchi. "A stout Irish woman, disposed to clamor and to make violent efforts, was in a former labor attacked with bronchial laceration, but recovered without a single bad symptom. The second delivery was by forceps."

BODDANT, *Gazette medicale*, 1840.

Primipara, age 28, otherwise well and has never had any disease of the respiratory organs. Her labor was prolonged, and the descent of the fetal head very slow. During a pain the patient suddenly became hoarse, and a swelling was noticed on the front of the neck, which soon spread over the sides of the latter; also the face and chest. There was some pain over this area which gradually extended. Forceps were finally resorted to as no further progress had been made. The child was dead. Three days later the emphysema began to subside, the face being first freed, then the thorax and finally the neck. In two weeks recovery was complete.

(Pelvic contraction was very probably present in this case, as shown by the slow engagement of the head and its subsequent fixation in the pelvis.)

DECADAS, *De medicin et chirurg. prat.*, vol. vii., No. 4. (Cited by Depaul, q. v.)

A delicate primipara of nineteen developed a severe pleurisy early in the eighth month of her pregnancy. A week later labor began, the pains were severe and the patient screamed a great deal for over four hours. Soon after a crepitant swelling appeared on the upper portion of the chest, which quickly spread over the neck, face and extremities. There was a great deal of congestion over the face and neck, and venesection was done. The dyspnoea, which had been present during this time was then relieved, and the emphysema spread no further. The latter gradually disappeared in about ten days.

(It is not possible to state at what period of the labor the emphysema appeared, nor is there any mention made of pelvic deformity or at what point the swelling began. Reports of this kind, lacking in essential details, are, unfortunately, quite numerous.)

DEPAUL, M., *Gazette medicale*, 1842, Oct. 29.

The patient, 32 years of age, had gone through a perfectly normal labor. The second pregnancy was uneventful and labor came on in a perfectly normal manner. As soon as the pains began the fetal movements ceased and the fetal heart sounds were no longer heard. The labor continued, however, dilatation proceeded, and the head descended into the pelvis. It seemed to stick at the outlet although no abnormality could be determined at this point. The patient's condition was very good until this time, when she was suddenly seized with a dyspnoea, the pulse became small and frequent, and the face assumed a purple color. The woman complained of a severe pain in the head and begged to be delivered. Forceps were applied and a hydrocephalic head delivered with some difficulty. The patient died on the following day. An autopsy showed no injuries anywhere along the bronchial tree, but the lungs showed every evidence of a recent emphysema.

(Although there was no subcutaneous emphysema present in this case, it shows the pulmonary accidents which may take place under the same circumstances.)

ABBOTT, *Amer. Journ. Med. Sciences*, 1851, vol. xxii., n. s., p. 81.

Probably a primipara. In this case the emphysema involved the face, neck, chest as far down as the third rib, and the eyes were nearly closed. There was no dyspnoea or other inconvenience except a sense of extreme distension. The condition subsided in eight days. After labor there was marked tenderness above the upper border of the sternum. The writer suggests that the air escaped in the neighborhood of the bifurcation of the trachea.

JOYNES, L. S., *Amer. Journ. Med. Sciences*, 1852, vol. xxiii., p. 281.

Case observed by the writer at the Dublin Lying-in Hospital. Primipara, with a tedious first stage. As the head came down on the perineum, the face and neck began to swell and some dyspnoea was complained of. The swelling extended over the face, neck, chest and arms, and there was considerable tenderness on pressure above the clavicles. The labor terminated naturally, and could not be called severe. To relieve the condition the patient was bled twenty ounces in accordance with the custom of the times. Recovery, uninterrupted, by the ninth day.

TOP, R., *Edinburgh Medical Journal*, 1855, p. 152.

Primipara, age 25, with a slow and tedious labor, occiput posterior. During a severe expulsive pain the patient suddenly complained that she could not see, and examination disclosed an emphysematous swelling of the face which included the eyelids and then extended down the neck and anterior part of the thorax. The labor was terminated by forceps. A

slight dyspnoea was present. The emphysema disappeared in about eight days, and in subsequent labors, which were witnessed by the writer, no further disturbances of this kind occurred.

TODD, M., *Archive gen de Medicin*, 1856, vol. vii., p. 105.

A primipara, in labor about nine hours, observed quite suddenly during a severe pain, that she was unable to see. It was then found that the neck, face and anterior aspect of the thorax were emphysematous. No other symptom was complained of. The labor was immediately terminated with forceps, although the head was at the outlet. The patient made an uninterrupted recovery without further complication.

SINCLAIR AND JOHNSTON, *Practical Midwifery*, London, 1858.

Present a record of seven cases of subcutaneous emphysema occurring in 13,748 deliveries at the Dublin Lying-in Hospital. The average duration of labor was 17½ hours, and the condition arose in every instance from overstraining in the latter part of the second stages, and generally subsided in five or six days. The patients were all primiparæ, the ages varying between 21 and 28, and with the exception of two the labors were normal. In one of these a small pelvis necessitated craniotomy, in the other the forceps were used. Recovery in all was uneventful.

REEVE, J. C., *Cincinnati Lancet and Observer*, vol. ii., 1859, p. 656.

Primipara, with a dry labor and rigidity of the soft parts. There was much pain and suffering, and the patient's bearing-down efforts were excessive. Shortly before the birth of the child, the woman's face began to swell and this extended down over the chest and neck. The eyes were closed, but there were no subjective symptoms of note. The patient made a complete recovery in about eight days.

KNOWLTON, C. L., *Boston Med. and Surg. Journ.*, 1859-60, lxi., p. 32.

Primipara, age 27, in good general health. During the second stage she exerted herself tremendously, and the face became livid. A swelling was noticed in the neck, which extended over the upper half of the right breast and under the arm. No pain or dyspnoea was complained of except a "stitch" below the right clavicle on deep inspiration. The labor was still delayed, and the emphysema increased. The great resistance interposed by the soft parts was finally overcome and the child delivered. The emphysema then included the back and side of the head, the right side

of the body to the false ribs, and from the sternum in front to the vertebral column in back. Part of the left chest was also involved, but the face escaped entirely. The condition disappeared within a week, the last spot to be freed being an area behind the ear. A feeling of soreness under the right clavicle persisted for several months. There was no history of previous pulmonary disease.

BISHOP, E., *Lancet*, 1859, i., p. 412.

Primipara, with a rigid os and dry labor. Presentation and position normal, but very little progress made although the os finally dilated sufficiently to let the head come through. Her pains were very violent, and she strained a great deal. During one of these efforts she suddenly felt something give way in her chest, pointing to the region below the clavicle. The neck and face then became swollen and the eyelids tense. After the birth of the child, which occurred without further assistance, there was a free hemorrhage. A very distressing cough came on after labor, and three weeks later crepitation could still be felt on the right side from the cheek down to the breast.

PRATT, th., *Dublin Quart. Journ.*, xxxviii., 1864, p. 249.

Primipara, age 22, with an apparently normal labor during which the patient suddenly complained of dyspnoea, and was also unable to open her eyes. The entire face became swollen, also the neck and upper segment of the chest. Labor terminated uneventfully, but the emphysema spread over the entire body. On the second day it began to subside, and in about two weeks there was only remaining a small spot on the right side of the face.

DE SOYRE, JULES, *Gazette de hospitaux*, 1864, No. 92.

A primipara, age 23, in labor for over 24 hours, with a slow dilatation of the cervix. When the latter was complete the writer endeavored to push the cervix over the advancing part, and directed the woman to bear down. During one of these efforts the patient complained of a pain in the neck, and pointed to the space between the sterno-mastoid muscles. A swelling was noted in the right cheek, which next involved the eyelids and the other side of the face, then extended down the neck and over the chest to a line about 8 cm. below the clavicles. It was more marked on the right side than on the left. There was no interference with respiration, but swallowing was accompanied by pain. The emphysema disappeared within a week.

(It is probable that a pelvic contraction was present in this case.)

SHERIFF, *Canada Medical Journal*, 1870, vol. vi., p. 410.

Primipara, age 23, with rigid soft parts and small vagina; had a severe labor during which she "pressed down hard." Shortly after a swelling was observed on the left side of the face, which involved the eyelids and cheeks, and then extended down over the neck and breasts. There was no dyspnoea, and two hours after the beginning of these symptoms, labor was completed. The patient was exhausted and the pulse weak. On the second day the swelling began to disappear. The writer ascribes the emphysema to a laceration of the larynx.

WHITNEY, *Boston Med. and Surg. Journ.*, 1871, vol. 85, p. 350.

A primipara, with a severe and protracted labor, was suddenly seized with an attack of dyspnoea, and on examination an emphysematous area was found to have extended over the face, neck, chest down to the waist, which disappeared in a few days. Subsequent pregnancies are stated to have been normal.

MACKENZIE, *Amer. Journal of Obstetrics*, 1871, p. 203.

A primipara of 26, with an ordinary labor towards the end of which the pains were very severe. During the straining efforts the face became very red and congested. The woman complained of pain and stiffness in the face, and right after the completion of the labor the face was found to be swollen, the swelling extending over the neck and down to the sternum. It disappeared by the eighth day, the last point being over the clavicles. The writer thinks that the emphysema is due to rupture of the pulmonary air vesicles.

CLARKE, *Irish Hospital Gazette*, 1873, i., p. 165.

This case had been attended by a midwife who stated that the pain had not been very severe when the emphysema began, which extended over almost the entire body. There was no dyspnoea or pain. After one child was born a second was discovered, which was extracted by forceps on account of the slow progress of the labor. Both fetuses were dead, and of a very large size. The patient had a marked diarrhoea, which could not be checked, and she died nineteen hours after delivery from exhaustion. There was no autopsy.

(The details of the case are not satisfactorily stated.)

GRIGG, *Lancet*, 1874, vol. i., p. 620.

Primipara, age 23, in good general health, with a dry labor, the first stage of which lasted forty hours, the second six, and was accompanied by violent expulsive efforts. Next day she complained of a sore

throat, and a swelling was then noticed over the right side of the face and the neck. There was no cough or dyspnoea. Two days later the emphysema was found to have extended over the front of the chest, mostly on the right side. The writer states that the air in his opinion came from rupture of air cells near the root of the lung, and the first symptom complained of (the sore throat) was due to an effusion of air in the region of the pharynx. The condition disappeared within a period of seven days, and aside from a frequent pulse, no other symptoms were noted. Later examination showed that the patient had a flat pelvis.

(This case differs somewhat from the others in that the emphysema apparently first appeared under the mucus membrane of the pharynx.)

VERRIER, *Gazette obstetricale de Paris*. 1874, No. 16, p. 240.

In this case two small swellings as large in size as a nut were noted during labor in the region below the left clavicle. Crepitation was present, and there was also an extravasation of blood in the conjunctivæ. Recovery uneventful.

(No details being given in this case, it has very little value for statistical purposes.)

HAULTCOEUR, M., *These, Paris* (?), 1874, p. 34. (Ref. in Klots' article).

The case of a healthy primipara, 27 years of age. Although the pains were strong no progress was made, and examination showed that the cervix was not dilating. Later on in the day, during some very severe breaking-down efforts, a crepitant swelling was noticed in the middle line of the neck, which in time extended over the face and upper part of the chest. Forceps were then applied and the child successfully delivered. Two days later the swelling began to subside, and by the twelfth day it was gone. There were no subjective symptoms.

(It is possible that some pelvic contraction was present in this case, although the delay may in part be also ascribed to the rigid soft parts.)

Another case was a strong, healthy primipara, who had been in labor for two days when first seen. Dilatation was complete, the head was at the outlet but failed to advance. Renewed efforts at expulsion were accompanied by the appearance of a crepitant swelling in the middle line of the neck, which did not however extend, as the labor was immediately terminated by forceps. Within four days the emphysema disappeared.

(This case seems similar to the last.)

DELASALLE, M., in Haultcoeur's thesis, 1874.

Primipara of 37. On the second day of the labor a swelling was noted in the neck which extended over a

considerable portion of the body. On the arrival of the doctor, the patient was exhausted; there was marked dyspnoea and the extremities were cyanotic. The labor was completed without instrumental assistance, but the patient died on the following day. No autopsy done.

(The delay in the labor may be ascribed in all probability to the rigidity of the soft parts in a primipara well along in years. Death was probably due to extreme exhaustion, no other cause being advanced.)

BLAUD, *Medical Communications*, London, 1874, vol. i., p. 176.

The patient was a young primipara, otherwise in good health, who developed the emphysema during a painful and protracted labor which called forth severe straining efforts. The emphysema involved the eyelids, the face, thorax, with the right sterno-clavicular junction as the middle point. The lids were involved to such an extent that the woman was unable to see. There was no pain or other symptoms, and the condition disappeared within a period of ten days. The cause for the delayed labor is not stated.

ATHILL, B., *Obstet. Journ.*, 1876, vol. iv., p. 18.

A primipara, age 20, suddenly complained at the end of the expulsive stage of dyspnoea and interference with vision. A swelling appeared which involved the face, eyelids and neck. The labor terminated without particular effort. There was a slight cough, and the emphysema disappeared within ten days, having first extended however over the front of the chest and the back. The writer thinks that the rupture took place at the site of a former pleural adhesion.

ALEXEFF, *Arch. f. Gyn.*, vol. ix., 1876, p. 437.

Primipara, age 24, with a prolonged labor during which several attempts were made at forceps delivery. While in the act of straining a swelling was noticed above the sternum and right clavicle. On admission to the hospital, the entire face, neck, upper part of the chest, eyelids and lips were found to be the site of an emphysematous swelling. As the pelvic outlet was contracted and the arch narrow, forceps were again applied and the child extracted. There was moderate septic infection. The emphysema disappeared from the eyelids soon after labor, but continued unchanged over the remaining parts for five days, when it finally subsided to be entirely gone by the thirteenth day. There was no respiratory or circulatory disturbance.

WORTHINGTON, *Brit. Med. Jour.*, 1876, i., p. 124.

A primipara, age 26, face presentation, with severe expulsion efforts. An hour before delivery the woman

complained of not being able to see with the right eye, of which both lids were found to be much swollen. The neck, face, chest, abdomen and back, as far down as the level of the umbilicus, then became emphysematous. Delivery completed by forceps. The emphysema disappeared by the sixth day except in the area just above the sternum. Writer thinks that the condition was due to the rupture of the marginal air cells into the mediastinum.

PRINCE, A., *Lancet*, 1876, i., p. 117.

A primipara, with weak pains and very little straining effort. A swelling was suddenly observed which rapidly extended over the face, neck and chest. Dyspnoea and a cough were present for three or four days, but at the end of two weeks the condition had entirely disappeared.

DOWNES, *Brit. Med. Journ.*, 1876, ii., p. 8.

A primipara with a slow labor and the advancing head impacted between the tuberosities. Notwithstanding the violent and strong pains there was no advance. The face suddenly became puffy during one of the pains and then the swelling extended over the entire face and neck. Delivery effected by forceps. The patient made a good recovery, time not stated. An examination of the chest subsequently made showed no evidence of any thoracic lesions.

BURTON, *Brit. Med. Journ.*, 1877, ii., p. 663.

A primipara, age 20, with a slow labor and violent pains. The head remained impacted between the tuberosities, but finally advanced after considerable effort. The swelling which appeared in the face during one of the expulsive pains rapidly spread over the neck, chest and back. There were no further symptoms and the condition subsided completely by the end of the tenth day.

FISHER, *Zeitschrift fuer Wundärzte u. Geburtshelfer*, 1877, vol. xxviii., p. 100.

Case 1. A primipara, age 18, healthy, but with a narrow pelvis. The labor was dry with a prolonged second stage and no advance. Forceps applied, extraction difficult, during which the patient strained violently. Shortly after an emphysematous area was noticed under the left breast, which extended on the following day around the back to the vertebral column and in front to the sternum. Examination of the thoracic organs showed nothing abnormal. On the third day an extravasation of blood was noted under the conjunctivæ. These signs all disappeared within three weeks, and the puerperium was otherwise normal.

Case 2. A para IV., age 35, previous labors normal. The present labor tedious and painful, and examina-

tion disclosed a face presentation. Patient greatly exhausted. During the subsequent difficult forceps delivery, the woman strained violently, and after the completion of the labor an emphysematous area was observed which extended along the anterior border of the sterno-mastoid on the right side. Recovery uneventful. Emphysema ascribed to rupture of the pulmonary alveoli.

NELSON, H. S., *Edinburgh Medical Journal*, 1877, vol. xxiii., p. 43.

A primipara, 24, delicate and of slight build. After the head had been at the outlet for three and a half hours, a swelling was observed over the neck and lower jaw, which then extended backwards on each side of the neck to the edge of the trapezius muscle and down in front of the sternum for an inch. This area was painful. There were several attacks of dyspnoea marked by lividity of the lips. No advance being made, forceps were applied and the child delivered. The emphysema began to diminish the next day, and had entirely disappeared at the end of a week. The last point which it left was the region over the clavicle.

LAW, E., *Obstetrical Journ. of Great Britain and Ireland*, 1877, vol. v., p. 477.

Strong and healthy primipara, age 26, with an occiput posterior and a dry, tedious labor, which terminated naturally. The woman strained severely. Several hours later she complained of a pain on swallowing, and a small swelling was noted on the right side of the neck, which then extended up to the ramus of the jaw and down over the clavicle on the thorax to the posterior axillary line on the right side. On the left it was much less marked. There was no dyspnoea. Recovery in nine days.

HAUPT, *Medical Record*, 1880, vol. xviii., p. 697.

Primipara, age 19, in good general health. Delivery by breech, labor somewhat slow and as the head was being expelled severe bearing-down efforts were made. Immediately after the birth of the child, the woman complained of pain in the throat, the neck became swollen and this area was marked by crepitation. The latter increased rapidly in extent, the face became cyanotic, an uncomfortable sensation around the neck and chest was noticed and swallowing was painful. The emphysematous area involved, when complete, the face, temporal and occipital regions, the breasts and anterior surface of the chest and both arms down to the elbows. The condition subsided without further trouble and was no longer present by the tenth day.

LEATHAM, *Medical Press and Circular*, vol. i., 233.

A primipara, with a tedious and prolonged labor and severe pains. While the head was on the perineum, the right side of the throat, face, shoulder and arm became swollen. At the same time the patient became pale, cold, and the pulse weak. Labor terminated naturally without any extension of the emphysema. The condition disappeared in ten days. Subsequent labors normal.

PEPER, *Le Practiciens*, 1880, Feb. 9, 1880.

A primipara, age 24, with a prolonged labor necessitating the use of forceps. During the labor a swelling appeared above the right clavicle, which extended over the face, the neck and the thorax. Auscultation showed that respirations were more feeble in the right than in the left lung. The condition disappeared in twelve days. Ascribes the emphysema to rupture of the pulmonary alveoli.

HUBBARD, *Brit. Med. Journ.*, 1881, ii., p. 897.

A primipara, age 20, strong and healthy. The labor pains were strong and violent, but the head remained at the brim and engaged with difficulty. During one of these expulsive efforts the face suddenly became swollen and the eyelids closed. There was considerable dyspnoea present and the swelling quickly extended over the neck and chest. As the head failed to advance and no forceps were procurable, a craniotomy was done and the labor thus terminated, as the author believed this to be the only means of affording immediate relief to the patient. The face was swollen beyond recognition and remained so for two days. The local symptoms had all disappeared by the tenth day. Subsequent deliveries were without complications. (It is probable that there was some pelvic deformity in this case, for the writer states that high forceps were necessary in the succeeding labors.)

Lwow, *Centralblatt fur Gynekologie*, 1881, p. 115.

Primipara, 21 years of age, large, well nourished, with a normal pelvis. The labor was tedious and a large child was finally delivered by breech extraction. At the end of the first stage the face became swollen and cyanotic. The emphysema spread down over the neck and around to the back from the third rib up to the mastoid process. There was some cough and increased respiration, but this subsided after the birth of the child. By the seventh day the condition was entirely cleared up.

(It would seem that the large fetus was the cause of the delay in this instance.)

EISLER, M., *Centralblatt f. Gynekologie*, 1881, No. 3, p. 47.

Primipara, age 18, had a hemoptisis before becoming pregnant. Her pregnancy was perfectly normal,

but during labor there came on a cyanosis of the face, injection of the conjunctivæ and dyspnœa. On the next day the entire face, with the exception of the point of the nose and the chin, was markedly swollen, and this also extended over the neck and thorax. The puerperium was perfectly normal, and by the end of week the emphysema had entirely disappeared. The author ascribes the condition to the rupture of an interstitial pulmonary emphysema which had followed the previous pulmonary lesion.

DUNN, Boston Med. and Surg. Journal, 1883, vol. cviii., p. 397.

I. A primipara with a normal labor. During some violent expulsive efforts in the third stage a swelling was observed on the right side of the face, which began in the right inferior maxillary region and extended up to the zygoma and down the neck, without any other symptoms. Some hours later the entire chest and the right arm became involved, but within four days the condition began to disappear and subsequent labors were uncomplicated by this phenomenon.

II. A similar case, but in which the emphysema began at the upper part of the right chest under the clavicle and extended over the cheek, chest and arms.

MCLANE, J. W., N. Y. Med. Journ., 1883, vol. xxxvii., p. 582.

A primipara, age 21, with a first stage lasting only two hours, but characterized by unusually severe pains. Soon after the commencement of the second stage, the woman began to strain violently. During one of these efforts, her face became congested and purple, and a swelling appeared on the right side of the neck near the trachea which increased in size with each pain and extended to the right cheek. As soon as the patient became conscious after labor, she complained of a sense of constriction around her throat and difficulty in swallowing. The neck was now thick and edematous, the face puffed and the features effaced. The emphysema did not extend below the clavicle. Absorption was complete in a week. Writer thinks the condition was due to a rupture of the trachea, and also refers to another case in which he believed the rupture was in the pulmonary vesicles.

BENSON, Canada Lancet, 1883-84, vol. xvi., p. 235.

Primipara, age 21, with a labor progressing satisfactorily. A swelling of the face suddenly appeared which extended over the neck down to the third and fourth ribs. There was no dyspnœa or dysphagia. The straining efforts made by the patient were at no time severe. Recovery without incident.

CHABAZIAN, Archives de Tocologie, 1884, p. 403.

Primipara, age 20. Her labor proceeded slowly owing to rigidity of the soft parts, but after the cervix was fully dilated the patient began to bear down with great force, her face became purple and the conjunctivæ injected. During this effort a swelling appeared above the right clavicle, which extended upwards over the cheek, eyelids and back of the neck and downwards over the upper part of the thorax. Labor was completed naturally, and the emphysema did not extend any further. There was no complaint of pain or other symptoms, and in the course of a week the condition had totally subsided, being last to disappear from the neck. A careful examination failed to disclose any abnormalities along the respiratory passages.

(The delay was probably due in this instance to the resistance of the soft parts, although a moderate contraction of the pelvis cannot here be entirely ruled out.)

MILLER, A. C., Brit. Med. Journ., 1885, ii., p. 1108.

Case 1. Primipara, with a slow, dry labor, with severe pains and straining efforts. These ceased suddenly and the patient was gasping for breath and in collapse. The face became swollen and congested, the respiration rapid and irregular, the pulse weak and fluttering. Forceps applied and child delivered without difficulty.

Case 2. Primipara with a normal labor until towards the end when the woman's face became swollen, followed by that of the cheeks and forehead. There was pronounced dyspnœa.

In both of these cases of which no further details are given, the dyspnœa appeared on slight exertion during the puerperium, but a complete recovery resulted in ten days.

HUNTER, Brit. Med. Journ., 1885, ii., p. 791.

Primipara, with a not unusually tedious labor. Towards the end of the second stage she complained of pain in the throat, which was attributed to the powerful manner in which the buccinator muscles were used during the bearing-down efforts. Labor completed normally, and some time after a puffy swelling was noticed on the left side of the neck, which extended down over the upper part of the chest. Examination of the oral cavity showed at about the middle of the right cheek a small area denuded of mucus membrane with a surrounding patch of emphysema. The writer thinks that this constituted the point of entrance for the air in the subcutaneous tissues.

(It is hardly probable that the air gained entrance in the manner quoted for obvious reasons.)

KIRALYFI, Pester Med.-chirurg. Presse, 1885, vol. 21, p. 390.

A para vi., age 34, with a child six years previ-

ously, had a prolonged and difficult labor accompanied by much straining, but delivered herself without assistance. Immediately after the labor a swelling was observed which involved the face, the eyelids, the neck, and extended down the chest to the breasts. The mucus membrane of the mouth, pharynx and nose was likewise undermined by the air. There were no subjective symptoms aside from a slight feeling of thoracic depression. The condition subsided in about eight days.

BOXALL, R., *Lancet*, 1887, i., p. 122.

A primipara, age 19, with a tedious labor although no obstruction was present. Three hours after delivery the patient complained of soreness in the neck and upper part of the chest, beginning at the left sterno-clavicular articulation. Twelve hours later a puffy swelling was noticed over the manubrium sterni and the heart sounds at the base were marked by crackling. The emphysematous swelling finally involved the anterior surface of the chest, face and eyelids. The entire condition disappeared within a period of five days.

STALLARD, J. P., *Brit. Med. Journ.*, 1887, i., p. 155.

Primipara, 24, of slight build and delicate. The chest was negative. During the second stage the pains were severe and prolonged, and the placental delivery was accompanied by considerable hemorrhage. Soon after the patient complained of loss of eyesight. Examination showed extreme puffiness of the face, which extended down the neck and chest. There was no interference with respiration, and the condition disappeared in eight days.

REDFERN, *Lancet*, 1890, i., p. 343.

Primipara, 26, muscular, with a tedious labor. After rupture of the membranes the pains became strong and were accompanied by severe straining efforts. The patient then complained of a sore feeling in her throat, and soon after the lids of the right eye were found to be puffy and this swelling extended over the face. As the woman was exhausted, forceps were applied. The neck and chest then became involved in the emphysematous area, and the patient was very hoarse. In two weeks the condition had disappeared. The writer thinks that the air entered through an abrasion in the larynx or trachea as seems indicated by the hoarseness.

FILLIPOW (in Russian), ref. in Frommel's Jahresbericht, 1890, p. 288.

Only a meager report available. Patient had eclampsia, forceps delivery, with a dead child. On the next day an emphysema of the neck, face and

chest was observed. There were many moist rales, respirations 40, pulse 100. The writer thinks that pleural adhesions produced rupture of the pulmonary alveoli during the convulsions. Patient recovered.

ULRIK, ref. in *Centralbl. f. Gyn.*, 1897, p. 997.

Primipara, age 28, with a twin pregnancy. While the second child was being born, the emphysematous swelling appeared during a straining effort which involved the cheeks, neck, upper chest to the axilla. The labor was prolonged and forceps were necessary. There was pain and tenderness in the affected region for a few days and some dysphagia was also present. Within a period of two weeks the entire condition disappeared.

MUSGROVE, C. D., *Lancet*, 1897, ii., p. 252.

A primipara, age 22, with a normal labor which was merely prolonged on account of the large size of the child's head. The pains were violent and constant, and the patient bore down forcibly. About ten hours after she was seized with a violent pain at the left of the trachea, above the clavicle, which continued for an hour, and then passed off as suddenly as it began. There was no dyspnoea. A few hours later there was an extensive emphysema over the entire front of the chest. Recovery complete in ten days.

DE MOXCHY (ref. in Klots' article, *Zeitschrift f. Geb. u. Gyn.*, 1899, vol. xli., p. 382.

Primipara, 26 years of age, presented an early rupture of the membranes before any pains began. When the latter began they were severe, but the head engaged slowly and little progress was made. During the second stage, while the woman was bearing down strongly, the left side of the face became swollen and the eyelids closed. On the right side of the face this was less marked, but the neck and chest down to the breast was equally puffy. After the labor was terminated by manual pressure on the abdomen, the swelling in the face began to subside, and by the second day it had entirely disappeared. The pelvic measurements were as follows: distance between spines, 26 cm.; between crests, 28.5 cm.; external conjugate, 19 cm.; the internal conjugate could not be estimated. There was present therefor a generally contracted pelvis.

MAISS, *Centralbl. f. Gyn.*, 1889, No. 15, p. 420.

Primipara, age 17, in good general health but with the following pelvic diameters: Spines, 21; crests, 23; ext. conj., 16, 50; diag. conj., 10; true conj., 8-8, 50; a generally contracted flat pelvis and small vagina. The first stage was prolonged, the head engaging slowly. The pains were strong, and the patient bore

down hard. During the course of the second stage the face suddenly became cyanotic, the eyelids puffy, and then a swelling extended over the face, neck and thorax. By the ninth day it had all disappeared except on an area over the thorax. This was incised, and recovery was complete by the thirteenth day.

KLOTS, P. S., *Zeitschrift fuer Geb. u. Gyn.*, 1899, vol. xli., p. 382.

Primipara, age 25, in good health. The labor was somewhat tedious and the head advanced slowly. During one of the expulsive efforts the woman suddenly complained of pain and stiffness in the neck, which later on also involved the face. The face then became red and swollen, and the crepitant area rapidly extended over the neck, chest, right arm and hand, abdomen to a point below the umbilicus, and finally both flanks and the back. The scalp was also affected. Respiration was quick but not painful. The labor was then terminated artificially and a living child secured. The emphysema began to subside on the next day, beginning with the face, and by the end of the week had disappeared. A pelvic examination showed that there was a moderately contracted flat pelvis, diagonal conjugate, 11 cm.; distance between spines, 26.5 cm.; between crests, 28.5 cm.

(Klots collected 40 cases of this character from the literature up to 1897, and these, with a number of additional ones which evidently escaped his search, have been verified and incorporated in this report. Klots' paper is the first satisfactory contribution to the subject.)

STEVENS, *Glasgow Med. Journ.*, 1900, i., p. 102.

Primipara, age 20, healthy and with a roomy pelvis. Pains very severe after the head had descended on the perineum, but the straining efforts seemed to produce little advance. The face and eyelids suddenly became swollen during one of these pains, and then the emphysema extended down over the face, neck, chest and back, to the level of the crests of the scapulæ. The right arm was also affected. There was complaint of pain in the shoulders, sternum and neck. The emphysema disappeared first from the face and was gone in seven days. There was some dysphagia, but no dyspnoea.

BRAITHWAITE, *Lancet*, 1903, p. 731.

Primipara, age 24, small in stature. The pains were frequent and violent from the beginning. Shortly after the rupture of the membranes a swelling of the face and neck was noticed. When seen several hours later, she was having violent pains with extreme expulsive efforts, every three minutes. The head was L. O. A. and near the perineum. A well-marked emphysema had extended over the base of the nose,

both sides of the face, both sides of the neck and down over the front of the chest to the level of the nipples. There was a conjunctival ecchymosis, and the neck was painful on motion. The labor was concluded normally. The emphysema began to disappear from the sides of the nose on the next day, and gradually subsided in the other regions within two weeks. While straining at stool the sides of the neck felt puffed out.

HERMAN, *Zeitschrift f. Geb. u. Gyn.*, 1904, vol. liii., p. 503.

Case 1. Primipara, age 23, with a normal pelvis and fetus, R. O. A. Ordinary labor with strong, frequent pains. During one of the expulsive efforts the lids of the right eye became suddenly swollen, and the swelling then extended over the cheek and the region along the right carotid, the face, the chest and abdomen down to the level of the umbilicus. Delivery completed by forceps. Recovery in eight days.

Case 2. Primipara, has been the subject of nasal catarrh with cough and dyspnoea. On several occasions when blowing the nose, both lids of the right eye became suddenly swollen. Her labor was normal, and after the birth of the head, she still strained considerably. About an hour after delivery a sudden swelling of the eyelids was observed which closed the eye. The swelling then extended over the forehead, the face and the neck. The patient spoke with difficulty, and there was considerable dyspnoea. The chest, abdomen to the umbilicus, back, left arm and hand also became involved on the left side. The right side, upon which the patient had been lying, was not affected. Emphysema persisted until the seventeenth day. Subsequent examination showed an hypertrophy of the posterior end of the inferior turbinate on the left side, while in the meatus semilunaris was an opening into which a probe could be shoved a short distance. It is probable that in this instance the air entered through an abnormal communication between the nose and its accessory sinuses due to some previous ulcerative destructive process.

SPRAGUE, F. H., *Lancet*, 1905, ii., Oct. 28.

Primipara, 24 years of age, otherwise perfectly healthy. The labor was somewhat prolonged owing to a scanty supply of liquor amnii. Presentation vertex with occiput anterior. The pains were very violent, and chloroform was given throughout the second stage. As the head was being delivered over the perineum, it was noticed that the right side of the mother's neck was swollen. On examination after labor, the swollen area was found to have extended over the whole front of the chest on the right side down as far as the fourth rib. The supraclavicular fossæ were distended as well as the anterior and posterior triangles of the neck. The right side of the

face was swollen and the conjunctivæ injected. Voice nearly lost, patient not being able to speak above a whisper. Difficulty in swallowing and breathing was marked during the first twenty-four hours. Severe headache and a rise of temperature were present during the first two days, after which the symptoms subsided and recovery was rapid.

NEU, Beiträge z. Geb. u. Gyn., 1906, vol. xi, no. 2.

Primipara, age 24, healthy and strong. Examination of heart and lungs negative. The principal pelvic measurements were as follows: interspinous, 24.50 cm.; intercristate, 27.50; ext. conj., 18.50; diag. conj., 11.50. The labor was not particularly tedious, lasting 10 hours and 50 minutes. The patient bore down hard

and vomited a great deal during the labor, becoming cyanotic at times. After the termination of the labor the woman complained of headache, there was marked brachycardia, the pulse going down to 40 per minute, and a few hours later the right cheek became red and swollen. This swelling extended down the neck to the level of the second rib. There was no dysphagia. Examination of the oral mucosa showed it to be intact. The emphysema disappeared by the seventh day. The author calls attention to the condition of brachycardia in this case, which he ascribes to the bearing-down efforts, this producing an effect similar to that observed in the so-called Valsalva's phenomenon.