Subcutaneous emphysema and pneumomediastinum complicating labor in a twin pregnancy

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Although a rare complication of labor, subcutaneous emphysema and pneumomediastinum (Hamman's syndrome) must be considered in the parturient complaining of chest or neck pain, dysphagia, or shortness of breath. With conservative management, the prognosis is favorable. The case presented is the first of Hamman's syndrome complicating the labor of a twin gestation. The pathophysiology, symptoms, and management guidelines for the syndrome are reviewed.

Pneumomediastinum and subcutaneous emphysema (Hamman's syndrome) are rare complications of pregnancy; incidence estimates range from 1:2,000¹ to 1:100,000.² The world literature includes 190 cases to date.^{3,4}

The first reference to what may have been this syndrome was made in 1618 by the midwife to the queen of France, who wrote, "I saw that she tried to stop crying out and I implored her not to stop for fear that her neck might swell."⁴ It was not until 1784 that Simmons⁵ reported the first case of pneumomediastinum and subcutaneous emphysema associated with labor.

A review of 130 cases by Gordon⁶ in 1927 indicated that most patients were primiparous, that the syndrome developed during the second stage of labor, and that most cases were associated with prolonged labor. Reeder,³ in his 1986 review of 187 cases, agreed with Gordon's first two conclusions but stated that, by modern criteria, most of the first

and second stages were of normal duration. Additionally, delivered infants were of average size.

We describe the first case of Hamman's syndrome¹² complicating a twin pregnancy. Symptoms, signs, and pathophysiology of the disease are presented, and treatment guidelines are suggested.

Report of cases

With an estimated date of confinement of March 22, 1986, a 24-year-old gravida 1, para 0 woman with an ultrasonographic-confirmed twin gestation but otherwise unremarkable prenatal course presented at 3 PM on March 21. She complained of contractions at seven-minute intervals; these had begun 18 hours prior to admission. She denied fever, chills, abdominal pain, vaginal bleeding, spontaneous rupture of membranes, cough, and respiratory distress. She had been hospitalized at 31 weeks' gestation for observation and bedrest to prevent labor.

The admission head and neck examination was unremarkable. The lungs were clear, and breath sounds were normal bilaterally. Cardiovascular examination was within normal limits. Her abdomen was gravid, with both twins in the vertex presentation and the left twin in the inferior position. Both fetal heart tones were in 150 per minute range. The cervix was 5 cm dilated, soft, anterior, and 90% effaced, and the vertex was at -2 station.

The patient was dilated completely by 4:30 PM. The second stage of labor proved difficult; it required vigorous pushing and intravenous administration of oxytocin. Aided by low-outlet forceps and third-degree midline episiotomy, the first female twin, weighing 5 lb 14 oz, was delivered at 6:36 PM. The second female twin, weighing 8 lb 7 oz, was delivered similarly at 7:00 PM. Apgar scores for the first baby were 7 and 8 at 1 and 5 minutes, respectively, while the second twin's scores were 8 and 9, respectively.

After delivery, the patient received a local infiltration of Xylocaine, and episiotomy repair was begun. During the procedure, she noticed neck and chest discomfort but did not alert the staff until three hours later, when she complained of substernal chest discomfort, dysphagia, and mild shortness of breath.

On examination, she was in moderate distress. The lung fields were clear, but these were mildly diminished breath sounds over the right hemithorax and fine crepitation to palpation along both lateral margins of the neck, bilateral supraclavicular areas, and the sternum. Heart rate was regular, with normal heart sounds.

Chest roentgenography revealed pneumomediastinum and marked soft-tissue air extending from the cervical region to the anterior chest and abdominal wall (Figs 1, 2). An electrocardiogram was normal.

The patient was transferred to the intensive care unit for close observation. By the third postpartum day, she was asymptomatic and had partial resolution of the subcutaneous emphysema. No further problems were observed, and she was discharged on the fifth postpartum day. There have been no further complications.

Discussion

Pathophysiology

Pneumomediastinum may be classified etiologically as follows⁷: Rupture of marginal alveoli into pulmonary interstitial tissue, then to the mediastinum; air entering the mediastinum from deep-tissue planes in the neck or from the retroperitoneal space; perforation of the trachea, bronchus, or esophagus into the mediastinum; or mixed etiologic factors, such as spontaneous pneumomediastinum or chest wall trauma.

A mechanism of injury in the development of pneumomediastinum was hypothesized by Macklin and Macklin.⁸ They maintain that alveoli adjacent to blood vessels rupture from increased intra-alveolar pressure, which results in pressure gradient in the perivascular sheath. Following the path of least resistance, the air makes its way toward the hilus. Air then dissects via tissue planes to subcutaneous areas in the face, neck, supraclavicular region, chest, and abdominal walls. Retroperitoneal areas may be affected similarly. If air passes between visceral and parietal pleura, pneumothorax results.

During labor, prolonged, intense Valsalva's maneuvers against a diaphragm immobilized by the gravid uterus could generate sufficient pressures to cause alveolar rupture in some patients.⁹ Because most patients develop the syndrome during the second stage of labor, this mechanism could account for the majority of cases.¹⁰

Symptoms and signs

The type and severity of symptoms depend on the degree of compression of the lungs and me-

Figs 1, 2. Posteroanterior chest film (Fig 1) obtained during inspiration demonstrates pneumomediastinum and marked soft-tissue air in the neck region. Lateral view (Fig 2) shows soft-tissue air subcutaneously along the sternum and anterior abdominal wall.

diastinum, the air dissection pattern, and the final location of the dissected air. The most common symp-

tom is chest pain, which is characterized as sharp, stabbing, or squeezing and severe in intensity, with variable radiation to the neck, shoulders, or back. The pain may be worse in the left lateral recumbent position, and sitting or leaning forward may alleviate the pain. Duration of pain may be from minutes to days. Other symptoms include dysphonia, aphonia, dysphagia, dyspnea, cough, swelling (which may become severe), sore throat, anxiety, hemoptysis, palpitations, shortness of breath, and crackling sounds in the chest.^{3,9,11,12}

Four diagnostically important clinical signs include mediastinal crepitation, decreased or obliterated cardiac dullness, subcutaneous emphysema, and pneumothorax.¹³

The specific finding of crepitation in synchrony with the heart beat (Hamman's sign) is present only on occasion.⁹ This finding is elicited most easily with the patient in the left lateral recumbent position during end expiration and can be detected phonocardiographically.¹⁴ Hyper-resonance over the sternum is best elicited with the patient upright.⁹

About 25% of patients show electrocardiographic changes, but no consistent pattern has been demonstrated. Significant abnormalities include T wave changes (especially inversion), deviation of the ST segment, decreased voltages, and shifts in electric axis.¹⁵ Roentgenographic findings may include pneumomediastinum, subcutaneous air, and pneumothorax.¹⁶

Management

In most cases, symptomatic treatment with bed rest, oxygen, and analgesics will suffice. If pneumomediastinum persists or enlarges, mediastinotomy may be indicated. Although pneumothorax is unusual and frequently resolves spontaneously, chest tube insertion may be required.¹⁷ Prognosis is excellent, but two deaths have been reported.¹⁸

Summary

The first case of subcutaneous emphysema and pneumomediastinum complicating the labor of a twin gestation is reported. The case is characteristic in that the patient had been previously healthy, the second stage of labor was prolonged and difficult, and the patient complained of chest pain, shortness of breath, and dyspnea.

Examination revealed subcutaneous crepitation to palpation and slightly diminished breath sounds. Radiographic findings were characteristic. The patient recovered with conservative management and no sequelae have been reported.

Hamman's syndrome should be suspected in the parturient who complains of chest pain, shortness of breath, or dysphagia or who has facial or nuchal swelling.

1. Kosmak GW: Subcutaneous emphysema following labor, letter. *Surg Gynecol Obstet* 1925;40:434.
2. Kobak AJ, Abrams RH: Pregnancy complicated by massive subcutaneous emphysema of mediastinal origin (Hamman's syndrome). *Am J Obstet Gynecol* 1949;47:789-792.
3. Reeder SR: Subcutaneous emphysema, pneumomediastinum, and pneumothorax in labor and delivery. *Am J Obstet Gynecol* 1986;154:487-489.
4. Karson EM, Saltzman D, Davis MR: Pneumomediastinum in pregnancy: Two case reports and a review of the literature, pathophysiology, and management. *Obstet Gynecol* 1984;64(suppl 3):39S-43S.
5. Simmons ST: A case of emphysema brought on by severe labor pains. *Lond Med Common* 1784;1:176.
6. Gordon CA: Respiratory emphysema in labor, with 2 new cases and review of 130 cases in literature. *Am J Obstet Gynecol* 1927;14:633-646.
7. Gray JM, Hanson GC: Mediastinal emphysema: Etiology, diagnosis, and treatment. *Thorax* 1966;21:325-332.
8. Macklin MT, Macklin CC: Malignant interstitial emphysema of the lungs and mediastinum as an important occult complication in many respiratory diseases and other conditions: An interpretation of the clinical literature in the light of laboratory experiment. *Medicine* 1944;23:281-358.
9. Aisner M, Franco JE: Mediastinal emphysema. *N Engl J Med* 1949;241:818-825.
10. Crean PA, Stronge JM, FitzGerald MX: Spontaneous pneumomediastinum in pregnancy: Case report. *Br J Obstet Gynecol* 1981;88:952-954.
11. Lam CA: Mediastinal and subcutaneous emphysema during labor: Report of a case. *Obstet Gynecol* 1967;29:378-381.
12. Hamman L: Mediastinal emphysema. *JAMA* 1945;128:1-6.
13. Fagin ID, Schwab EH: Spontaneous mediastinal emphysema. *Ann Intern Med* 1946;24:1052-1072.
14. Hoffman AM, Pobirs FW, Merliss, R: Phonocardiogram in spontaneous interstitial emphysema of mediastinum. *Am Heart J* 1943;26:686-691.
15. Brandfass RT, Martinez DM: Mediastinal and subcutaneous emphysema in labor. *South Med J* 1976;69:1554-1555.
16. Furst NJ, Lawrence LR: A case of bilateral pneumothorax, associated with pneumomediastinum, atelectasis, pulmonary edema and subcutaneous emphysema, occurring in labor: Mediastinal air block. *Am J Roentgenol* 1949;62:798-806.
17. Horvick JH, West OT: Mediastinal and subcutaneous emphysema in early pregnancy. *Obstet Gynecol* 1954;4:606-610.
18. Spellacy WN, Konald A, Prem KA: Subcutaneous emphysema and pregnancy: Report of 3 cases. *Obstet Gynecol* 1963;22:521-523.

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Carcinogenesis, mutagenesis, impairment of fertility: No evidence. **Teratogenic effects:** **Pregnancy category B:** No effect in animals. Not recommended for use in pregnancy. **Lactation and delivery, nursing mothers, pediatric use:** Use is not recommended. **ADVERSE REACTIONS:** 9.4% of 4123 patients dropped out of studies because of an a.d.r. **Incidence >1%:** *Gastrointestinal:* Dyspepsia*, diarrhea*, abdominal pain*, nausea*, constipation, bleeding, flatulence, elevated liver enzymes and vomiting. *Central nervous system:* Headache, "stimulation" (e.g., anxiety, insomnia, reflexes increased, tremor) and "inhibition" (e.g., anasthenia, somnolence, malaise and depression). *Respiratory:* Rhinitis. *Dermatologic:* Rash. *Special senses:* Dizziness, tinnitus and changes in vision. *Genitourinary:* Signs and symptoms suggesting a urinary tract infection*. *Body as a whole:* Edema*. *Metabolic/nutritional:* E weight changes. *Reaction in 3 to 7% of patients. **Incidence <1% (Causal relationship probable):** *Gastrointestinal:* Peptic ulcer disease (See Warnings), gastritis, bloody diarrhea, stomatitis, esophageal disease, hematemesis and hepatitis, cholestatic and non-cholestatic jaundice. *Central nervous system:* Ataxia, cerebrovascular ischemia, confusion, paresthesia, twitching. *Hematologic:* Decrease in hemoglobin and hematocrit, iron eosinophilia and eczema, thrombocytopenia, hemolytic anemia and aplastic anemia. (See Precautions) *Respiratory:* leukopenia, anemia, deficiency Asthma and epistaxis. *Dermatologic:* Angioedema, urticaria, eczema and pruritus; photosensitivity, toxic epidermal necrolysis and exfoliative dermatitis. *Special senses:* Conjunctivitis and parosmia. *Genitourinary:* Hematuria and impairment of renal function, interstitial nephritis. *Body as a whole:* Anaphylactic reactions, chills, fever. *Metabolic/nutritional:* Hyperuricemia. *Cardiovascular:* Heart failure, hypertension, vascular disease, vasodilatation. **Incidence <1% (Causal relationship unknown):** *Gastrointestinal:* Periodontal abscess, appetite changes, cholecystitis and dry mouth. *CNS:* Convulsion, meningitis, hypotonia, cerebrovascular accident, emotional lability and subarachnoid hemorrhage. *Hematologic:* Lymphadenopathy. *Respiratory:* Bronchitis, laryngitis, dyspnea, pulmonary embolism, pulmonary infarct, hyperventilation. *Dermatologic:* Alopecia, nail disorder, herpes, dry skin, sweating. *Special senses:* Ear disease, corneal opacity, glaucoma, retrobulbar neuritis, change in taste, transient hearing loss, retinal hemorrhage. *Genitourinary:* Menstrual disturbances, vaginitis and uterine hemorrhage, vulvovaginitis, prostate disease. *Metabolic/nutritional:* Hyperkalemia. *Cardiovascular:* Arrhythmias, angina pectoris and myocardial infarction. *Musculoskeletal:* Myasthenia. **DRUGS AFFECTING ANSAID:** **AGE AND ADMINISTRATION:** To 300 mg daily, administered bid or qid. (Most experience in rheumatoid arthritis has been with tid or dosage). Dose should be tailored to severity of symptoms and patient response. Store at controlled room temperature (15-30°C). Federal law prohibits dispensing without prescription.

References

1. Lomen PL, Lamborn KR, Porter GH, et al: Treatment of osteoarthritis of the knee: A comparison of flurbiprofen and aspirin. *Am J Med* 1986; 80(suppl 3A): 97-102.
2. Brown BL, Daenzer CL, Hearron MS, et al: Comparison of two dosing schedules of flurbiprofen for patients with rheumatoid arthritis. *Am J Med* 1986; 80(suppl 3A): 19-22.
3. Busson M: A long-term study of flurbiprofen in rheumatological disorders: I. Rheumatoid arthritis. *J Int Med Res* 1986; 14:1-6.
4. Busson M: A long-term study of flurbiprofen in rheumatological disorders: II. Osteoarthritis. *J Int Med Res* 1986; 14:7-12.
5. Busson M: A long-term study of flurbiprofen in rheumatological disorders: III. Other articular conditions. *J Int Med Res* 1986; 14:13-18.
6. Kieffer G: Flurbiprofen: A multicenter trial in 11,500 ambulatory patients (French). *Rev Med* 1981; 22: 915-924.

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