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A Review of Group B Streptococcus (GBS) in Young Adults: Emerging Concerns Beyond the Neonatal Population

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Abstract

Streptococcus agalactiae, or Group B Streptococcus (GBS), is a gram-positive bacterium traditionally associated with neonatal infections but is increasingly recognized as a significant pathogen in adults. GBS is the increasingly growing etiology amongst adult population. In this review, we highlight that adult physicians should be aware of this iceberg effect of the GBS amongst the adult cohort. This case study details a rare instance of GBS causing empyema necessitans (EN), a severe complication of pleural empyema, in a young male patient with type 1 diabetes. The patient presented with left-sided chest pain, productive cough, and fever, which progressed despite initial outpatient antibiotic therapy requiring subsequent surgical intervention which revealed a fistulous tract between a chest wall abscess and the pleural cavity. Intraoperative findings and postoperative CT scan confirmed EN. Furthermore, GBS was the causative agent. This case underscores the importance of early diagnosis and multidisciplinary treatment of EN and highlights the evolving role of GBS as a pathogen in adult populations, particularly among those with underlying health conditions such as diabetes.

Keywords: Streptococcus agalactiae, adult, Empyema, Chest pain, fever.

Introduction

Streptococcus agalactiae, commonly known as Group B Streptococcus (GBS), is a gram-positive bacterium traditionally associated with pregnancy and neonatal infections.**[1]** However, in recent years, there has been a growing recognition of its significance in causing infections in the adult population.**[2]** This article delves into the epidemiology, clinical manifestations, diagnosis, treatment, and prevention of Streptococcus agalactiae infection in adults. We report an interesting case of GBS infection in a young patient.

Empyema necessitans is defined as the rupture or extension of the empyema from the pleural cavity through the chest wall.**[3]** It is a rare complication of empyema, which was first reported in the eighties by identifying the communication between pleural and superficial chest wall collections and confirming similar tissue plane characterizations in both areas ultrasonographically.**[4]** Empyema necessitans are mostly a result of inadequately treated empyema, a collection of pus within the pleural cavity, which can progress to necrotizing pneumonia or lung abscess and eventually lead to empyema necessitans.**[5]**

Case Study

We present a case of a male patient in his thirties referred by his General Practitioner (GP) to the Emergency Department (ED) presenting with left-sided chest pain persisting for 3-4 days. On evaluation in the ED, the patient reported chest pain exacerbated by movement and breathing, with increased pain on deep inspiration. He did not experience shortness of breath but had a productive cough with dark green sputum for the past few days. He also mentioned having had a fever of 38.7°C a few days prior. The patient, a known type 1 diabetic, had not missed any insulin doses recently. He denied any nausea, vomiting, diarrhea, or constipation, and reported no issues with urination. His appetite remained good. There was no calf pain or swelling, no history of long-distance travel, and no palpitations, headaches, or visual disturbances. Chest exam revealed quiet breath sounds. Physical examination revealed decreased breath sounds on chest auscultation and a firm, hard swelling on the left anterior chest wall.

He lived at home with his family and was independent. While he occasionally vaped and smoked a cigarette every few months, he didn't drink alcohol and avoided recreational drugs. He had a history of type 1 diabetes, asthma, and anxiety.

Given his elevated blood glucose levels, he was initiated on a variable rate insulin infusion (VRII) to prevent diabetic ketoacidosis. Initial blood tests showed raised inflammatory markers, prompting the initiation of Levofloxacin and Doxycycline for broad-spectrum and atypical coverage. A CT thorax was initially requested to further characterize the mass but was canceled by the radiology department due to the low likelihood of malignancy in view of his young age and high inflammatory markers which point towards an infective process. He was discharged with a follow-up planned in the same-day emergency care unit (SDEC) in seven days.

A week later, the patient was reviewed in SDEC. He reported persistent and worsening pain in the left chest. On examination, the left side of his chest was

warm, slightly erythematous, and very tender to touch. There was no obvious discharge or skin break. He denied any sweating or fever. Laboratory results revealed significantly elevated inflammatory markers (CRP 269, WCC 21.70, Neutrophils 18.84). Given these clinical and laboratory findings, he was admitted to the surgical ward for further evaluation and management. The general surgery team diagnosed him with a large left-sided chest wall abscess and scheduled him for an incision and drainage procedure.

Management

Intraoperative findings revealed a fistulous tract extending from the abscess cavity, which drained approximately 600 ml of greenish pus content, into the left pleural cavity at the 5th intercostal space. This cavity was connected to a large empyema at the apex of the left lung, characterized by a septated collection. The parietal pleura and lung surface were thickened, with several sub-centimeter nodules detected on the lung surface. A 26F chest drain was inserted through this fistulous tract into the pleural cavity. The wound was left open with a large incision on the chest wall.

Postoperatively, the patient was admitted to the Intensive Care Unit (ICU) for invasive ventilatory support and management of septic shock. He was administered Ciprofloxacin, Metronidazole, and Vancomycin. He was started on a variable rate insulin infusion for euglycemic control and nasogastric feeding was initiated.

Postoperative chest imaging confirmed appropriate endotracheal tube placement and chest drain positioning. A small pocket of air was identified within the chest wall soft tissues on chest X-ray, not consistent with pneumothorax. A subsequent CT scan of the thorax corroborated endotracheal tube placement and demonstrated successful drainage of a left anterior chest wall abscess, with the chest drain terminating appropriately in the left pleural space at the level of the 4th/5th intercostal space.

An air-filled cavity measuring 1 x 6.9 x 4.2 cm remained in the left pleura, but no significant volume of fluid was detected. There was focal airspace consolidation in the adjacent lingula segment, without any signs of lung necrosis or cavitation. The scan also showed a small volume of left-sided posterior pleural effusion with bi-basal subsegmental inflammatory changes, no suspicious lung parenchymal lesions, and no significant hilar, mediastinal, or axillary lymphadenopathy. No bony fractures were noted, and the imaged upper abdominal viscera appeared normal within the scan's limitations.

The CT findings were discussed with the cardiothoracic team for Open thoracotomy or Video-assisted thoracoscopic surgery (VATS), who recommended conservative management. A discussion with the regional cardiothoracic center in view of the risk of mediastinitis and the need for pleurectomy. It was deemed that as the septic focus was draining, proactive surveillance was deemed appropriate at that time. It was advised to extubate the patient and no further surgical interventions were planned as the sepsis marker improved and the patient started to improve.

Laboratory results on the first day post-surgery showed significantly elevated inflammatory markers, with a CRP of 236 and a WCC of 28.20. Other notable results included HbA1c of 112, fasting glucose of 7.9 mmol/L, hemoglobin (Hb) of 107, and platelets of 605. On the second day post-surgery, the patient was deemed stable enough to be transferred from the ICU to the surgical ward. The chest drain was kept in situ and was flushed twice daily to ensure proper drainage and prevent blockage.

The culture and sensitivity of the abscess pus grew Streptococcus agalactiae, which was sensitive to Clindamycin, Erythromycin, and Penicillin. To investigate the underlying cause of the abscess formation, the patient was tested for hepatitis, HIV, and tuberculosis, all of which returned negative results. Additionally, tumor markers CEA, CA19-9, and AFP were all within normal ranges.

Another CT thorax was requested on the 6th day post-surgical drainage. However, after discussing with the radiology department, it was determined that there is no current indication for an immediate CT, given that a CT thorax was already performed on day 1 post-op. Additionally, the radiology team advised that an interval CT thorax in three months would be more beneficial for assessing the status of the drained abscess. Consequently, the request for an immediate CT was deferred in favor of this approach.

On discharge, follow-up appointments were scheduled: in the tissue viability clinic in 2 weeks, in the thoracic surgery clinic in 4 weeks, and in the general surgery clinic in 6 weeks.

Discussion

Streptococcus agalactiae (Group B Streptococcus, GBS) is well known for causing neonatal sepsis and meningitis. **[6,7]** Since the 1930s, many cases of infections caused by Streptococcus agalactiae in adults have been reported. **[8,9]** However, lung involvement, including pneumonia and abscesses, caused by S. agalactiae in adults is very uncommon.**[9]** S. agalactiae possesses certain virulence factors like capsule production that could potentially contribute to abscess formation, although further research is needed to solidify this connection.

The incidence of GBS infection in adults is increasing, primarily affecting the elderly and individuals with chronic diseases such as diabetes, cardiovascular disease, and cancer.**[8]** Diabetes is the most common coexisting condition with GBS infections.**[10]**

Clinical Manifestations

GBS infections in adults can range from mild to severe, presenting in various forms.**[2]** The most common manifestations of GBS in adults are skin and soft tissue infections, often presenting as cellulitis, abscesses, or infected ulcers. Moreover, diabetes is a well-known predisposing factor to soft-tissue infections, which might explain why skin and soft tissue infections are the most common manifestations of GBS at the same time that diabetes is the most common coexisting disorder with adult GBS infections.**[9,10]** GBS can cause bloodstream infections, which may lead to sepsis, a life-threatening condition characterized by systemic inflammatory response syndrome (SIRS). Particularly in older adults and those with underlying lung diseases, GBS can cause severe pneumonia.**[9]** GBS is also a recognized pathogen in urinary tract infections, especially among elderly women.**[2]** Osteomyelitis and septic arthritis are severe but less common manifestations.**[11]** Although rare in adults, GBS can cause meningitis, which requires prompt medical attention.

Empyema is defined as the collection of pusses in the pleural space due to infective cause.**[12]** The source of the infection is usually from an adjacent infective origin such as pneumonia or penetrating trauma. Empyema necessitans is a relatively rare complication of pleural empyema, characterized by the extension of a purulent collection from the pleural space into the extra-pleural tissue resulting in the formation of a chest wall abscess.

[13,14] In our patient, a chest X-ray performed nine days prior to his presentation with chest wall symptoms was normal. No additional chest X-rays were done in the interim, making it difficult to ascertain the exact cause or source of the empyema necessary in his case. Empyema typically occurs in the anterior chest wall between the midclavicular and anterior axillary lines and between the second and sixth intercostal spaces; other locations such as the bronchi, esophagus, and diaphragm are also possible.**[15]**

Empyema, in general, is typically polymicrobial, with Streptococcus species being the most common organisms, whereas Mycobacterium tuberculosis is the predominant causative pathogen of empyema necessitans. **[13,16]** The culture and sensitivity of the abscess pus taken from our patient grew Streptococcus agalactiae, commonly known as group B Streptococcus. Streptococcus agalactiae is rarely isolated from lung infections, as mentioned above.**[17]**

There are no specific signs and symptoms for empyema necessitans, the most common initial presentation is a slightly demarcated chest wall lump that is erythematous and painful. **[14,18]** Constitutional symptoms are usually also present, and they can present months before the presentation of the chest wall abscess symptoms which delays the diagnosis of empyema necessitans. **[14,19]** This asymptomatic and slow progression of the disease might be a contributing factor to the recurrent presentations of our patient with DKA, given that infection is a well-known precepting factor of DKA.

Empyema necessitans is most commonly seen in immunocompromised patients.**[20]** Although diabetics are not classified as immunocompromised per se, hyperglycemia is known to impair immune system function.**[21]** This makes diabetic patients more susceptible to infections compared to their non-diabetic, immunocompetent counterparts. The poorly controlled diabetes in our patient may be a contributing factor to the development of Empyema necessitans given that diabetes coexists with a lot of adult GBS infections.**[10]**

Streptococcus agalactiae is a rare causative pathogen of empyema necessitans, and to our knowledge, there have only been a few previously documented cases of group B Streptococcus empyema necessitans. **[17,22,23]** The grown Streptococcus agalactiae was sensitive to Clindamycin, Erythromycin, and Penicillin.

Diagnosis

The diagnosis of GBS infection in adults involves several steps. Starting with a thorough patient history and physical examination to identify symptoms and risk factors. Blood cultures, wound cultures, or urine cultures are essential for isolating and identifying the bacterium. In cases of deep-seated infections like osteomyelitis or pneumonia, imaging techniques such as X-rays, CT scans, or MRIs may be necessary.

The diagnosis of the Empyema necessitans can vary significantly from case to case depending on the presentation. After recognizing the signs and symptoms, a chest X-ray is typically the first diagnostic imaging performed, followed by a CT scan to confirm the suspected diagnosis.**[23]** In our patient, empyema necessities were suspected intraoperatively during an incision and drainage procedure for a large chest abscess by identifying the communication between the empyema from the pleural cavity through the chest wall via a fistula. The diagnosis was confirmed postoperatively by performing a CT scan of the thorax, as seen in **Figure 1**.

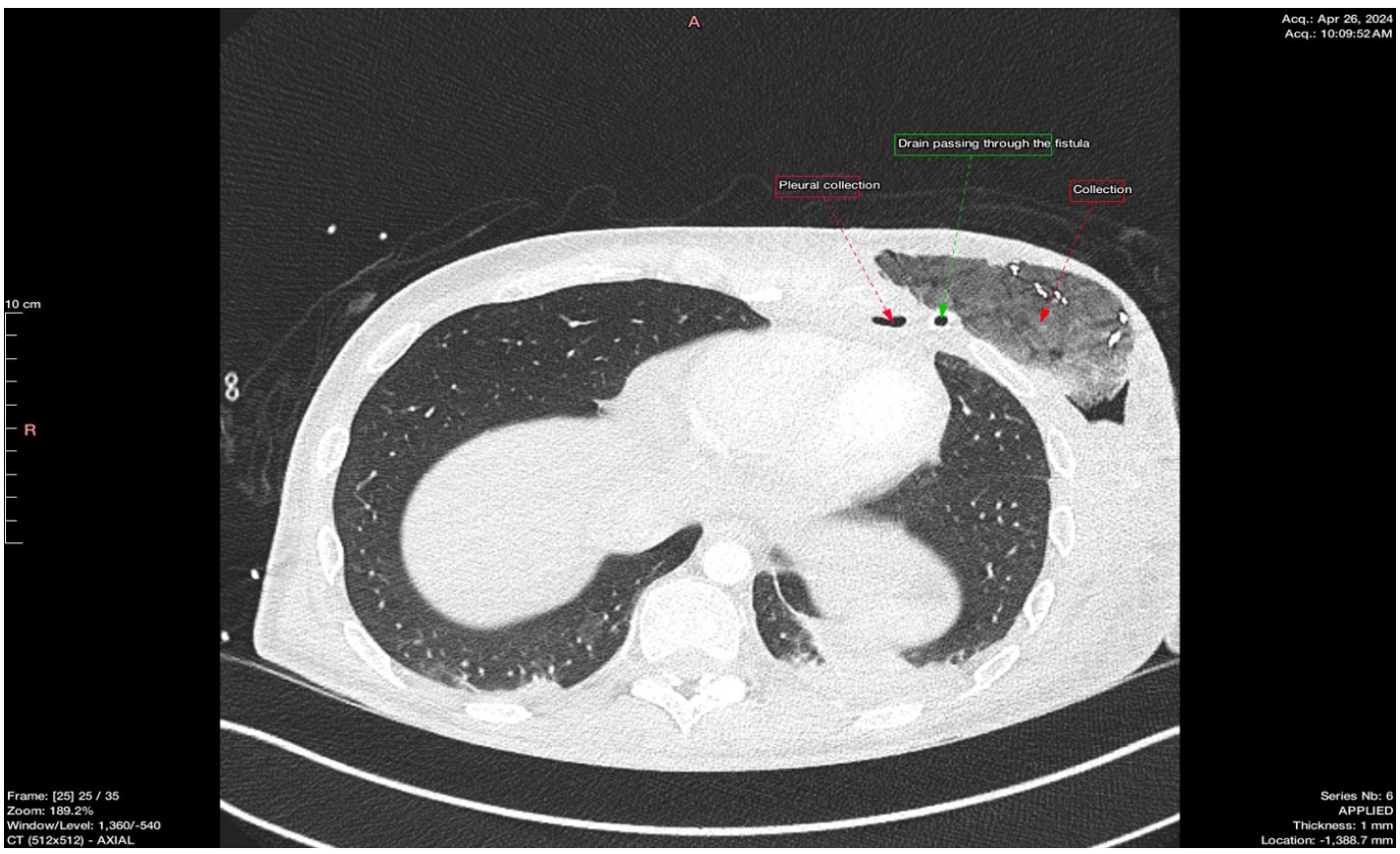

Figure: 1 CT scan showing the subcutaneous collection, drain passing through the fistula, and the pleural collection.

Treatment

The treatment of GBS infections in adults typically involves the use of antibiotics. Penicillin remains the drug of choice, often administered intravenously for severe infections. **[1.9]** Alternatives such as ampicillin, ceftriaxone, or vancomycin can be used, especially in patients with penicillin allergies.**[9]** The duration of antibiotic therapy varies depending on the infection's severity and site, ranging from a few days for uncomplicated cases to several weeks for more severe infections like endocarditis or osteomyelitis.

The treatment of empyema necessitans involves both medical and surgical management. Medical management includes the use of antibiotics, initially with broad-spectrum intravenous antibiotics until culture and sensitivity results are available. Once these results are obtained, targeted antibiotics are utilized to complete an extended treatment course, tailored to the individual patient's condition.**[17]** Surgical management typically involves procedures such as incision and drainage to evacuate the abscess and decortication of the lung parenchyma.**[23]** This comprehensive approach ensures that both the

infection and any structural complications are addressed, promoting optimal recovery and minimizing the risk of recurrence.

Prevention

Preventing GBS infections in adults, especially those at high risk, involves several strategies. Routine screening for GBS colonization in high-risk groups, such as diabetics or those with recurrent UTIs, may be beneficial. Proper wound care and hygiene practices can reduce the risk of skin and soft tissue infections. Multiple research and trials are ongoing in different phases to develop an effective GBS vaccine for adults, which could significantly reduce the incidence of invasive infections.**[24]** Lastly, optimizing the control of chronic diseases like diabetes can reduce susceptibility to GBS infections.

Conclusion

Streptococcus agalactiae, while traditionally linked to neonatal infections, is an increasingly important pathogen in the adult population. Recognizing the risk factors, clinical presentations, and appropriate diagnostic and treatment strategies is crucial for managing GBS infections in adults. Continued research and preventive measures, including the development of vaccines, hold promise for reducing the burden of this infection in vulnerable populations. As healthcare providers, awareness and vigilance are key to preventing and effectively treating GBS infections in adults.

Empyema necessitans, a rare complication of pleural empyema, involves infection spreading into the chest wall tissue, forming an abscess. Limited case reports and the lack of systematic reviews highlight the need for research to create standardized treatment guidelines. This case emphasizes the need for suspicion of empyema necessitans, even with negative X-rays or atypical symptoms. Early detection and combined medical and surgical treatment are crucial for better outcomes and preventing recurrence.

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