**Propionibacterium acnes** pleural empyema following medical thoracoscopy

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**Abstract**

*Propionibacterium acnes* (*P. acnes*) is a Gram-positive anaerobic rod and a common skin commensal that colonizes sebaceous glands. It has infrequently been associated with invasive opportunistic infections and can cause implant-associated infections through a biofilm mode of growth. Medical thoracoscopy is a common procedure for diagnosis and treatment of exudative pleural effusions; empyema is a recognized complication. We present a rare case of *P. acnes* pleural empyema 3 weeks following medical thoracoscopy and subsequent intercostal drain insertion for 3 days in a 75-year-old man. We postulate that pathogenesis may be associated with inoculation at the time of thoracoscopy or via biofilm formation on the intercostal drain. This case highlights the potential for this pathogen to cause clinically significant disease following thoracoscopy and pleural drainage.

**Introduction**

The risk of empyema complicating medical thoracoscopy is 2–3%. Gram-positive aerobic bacteria such as Streptococci and Staphylococci species are commonly implicated in empyemas though the bacteriology differs for nosocomial infections. Anaerobes account for approximately 5% of empyemas. *Propionibacterium acnes* (*P. acnes*), a Gram-positive anaerobic rod, is a common skin commensal. It has been associated infrequently with invasive infections and is recognized as an important opportunistic pathogen causing implant-associated infections [1]. We present a case of *P. acnes* empyema complicating medical thoracoscopy.

**Case Report**

A 75-year-old man with an 80 pack-year smoking history and a 3-year history of chronic bilateral exudative effusions had a medical thoracoscopy and talc pleurodesis prompted by symptomatic increase in his effusion on the right-hand side. His past medical history included rheumatoid arthritis (for which he took prednisolone 5 mg daily) and type 2 diabetes. At thoracoscopy, 1.6 L of haemorrhagic fluid was drained. Parietal and visceral pleura were thickened and inflamed throughout; seven pleural biopsies were sent for histology. Three grams of sterile talc was insufflated for pleurodesis and a 20-French chest drain was inserted. The chest drain remained in situ for 3 days post procedure. Pleural biopsy revealed non-specific benign reactive changes, fluid cytology showed benign cells only, and microbiological culture was negative. He was discharged 4 days post procedure.

Three weeks later, he presented to the hospital with increasing breathlessness, malaise, cough, and fever. Inflammatory markers were raised and chest radiography demonstrated a right-sided hydro pneumothorax and a stable left-sided effusion (Fig. 1). A chest drain was inserted, which drained turbid pus-like fluid. Pleural fluid chemistry was consistent with an empyema: pH 6.3, protein 34 g/L, lactate dehydrogenase 81,444 U/L, and lipids normal. Piperacillin/tazobactam was started empirically. *Propionibacterium* species was cultured from the pleural fluid. A second sample taken 2 days later was culture negative but *P. acnes* was identified on 16S rRNA polymerase chain reaction (PCR) testing. On direct questioning, the patient reported no acneiform rash at the time of initial thoracoscopy.

He improved initially with treatment and was discharged with a 4-week course of intravenous antibiotics; however, he was readmitted requiring further pleural
drainage. Three months following his index thoracoscopy he required surgical decortication due to an acute deterioration. At this point, Staphylococcus aureus (S. aureus) was isolated from the pleural fluid for the first time; no other pathogens were identified.

Discussion

Propionibacterium acnes is an anaerobic Gram-positive non-sporulating bacillus. It is predominantly a skin commensal and is assumed to have limited pathogenic potential. In human skin, it colonizes sebaceous glands and is most prevalent in sebaceous gland abundant sites including the chest, back, and axilla. The organism is slow growing and can be difficult to isolate, requiring extended culture for 14 days. Increasingly, sequencing of the 16S rRNA gene is used for identification. It can present as an opportunistic pathogen causing invasive and chronic implant infections through a biofilm mode of growth [1]. Propionibacterium acnes has been shown to form biofilms in vivo, in vitro, and on multiple different surfaces. The mechanism is not fully understood. Implant-associated P. acnes infections have been most commonly described in prosthetic joint infections but other sites include cerebrovascular shunts, cardiovascular devices, and breast implants. A major risk factor for P. acnes prosthetic joint infection is surgery in the areas with a high concentration of sebaceous glands. Propionibacterium acnes can recolonize wound edges between 30 and 180 min after antiseptic skin preparation, allowing seeding of the wound. It is thought to persist in the skin dermis despite antimicrobial precautions, allowing implantation intra-operatively.

We found only two previous case reports of pleural infections involving P. acnes. The first case occurred whilst the patient was undergoing treatment with the tyrosine kinase inhibitor gefitinib for primary lung adenocarcinoma [2]. Tyrosine kinase inhibitors are known to cause significant dermatological side effects that mimic acne vulgaris. The patient developed the classic papulopustular rash after initiation of gefitinib. She had a therapeutic aspiration of an existing malignant effusion through a chest site with overlying acneiform rash. Three months later, the patient presented with empyema and P. acnes was cultured from pleural aspirate and evidenced by skin colonization. All previous aspirates had been aseptic. The authors proposed bacterial inoculation at the time of aspiration as a route of pleural infection. The second case presented as an abscess within a pneumonectomy cavity 8 years after curative surgery for squamous cell carcinoma of the left upper lobe and was likely a late complication of surgery [3]. We identified one previous case report of P. acnes causing bronchopneumonia; Propionibacterium acnes was isolated from the culture following open lung biopsy in a patient with known chronic lung disease [4].

Our case highlights P. acnes as a potential pathogen in empyema. In our gentleman patient, possibilities for pathogenesis include inoculation with P. acnes from the dermis at the time of medical thoracoscopy or alternatively biofilm formation via the intercostal drain leading to empyema. Future considerations for clinicians should include the avoidance of pleural procedures through, or close to, skin sites where acneiform rash is present. Where appropriate, P. acnes infection should be considered and extended microbiological culture or PCR testing requested for bacterial identification. Polymerase chain reaction techniques to identify bacterial genetic material cannot differentiate between live and dead bacteria. In our gentleman patient, this may explain why the second sample was culture negative but PCR positive. Although S. aureus was isolated at the time of surgical decortication, this was some months later following further pleural procedures and at a time of acute clinical deterioration. Therefore, it is unlikely that S. aureus was a co-pathogen alongside P. acnes.

In conclusion, we have presented a rare case of P. acnes causing empyema following iatrogenic intervention, highlighting the potential for this pathogen to cause clinically significant disease in the context of thoracoscopy and indwelling pleural catheters.

Disclosure Statements

No conflict of interest declared.

Appropriate written informed consent was obtained for publication of this case report and accompanying images.
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