Curschmann's Spirals in Pleural Effusion in a 66-Year-Old Male with a History of Gastric Signet Ring Cell Adenocarcinoma with No Evidence of Metastasis

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ABSTRACT

We performed a cytologic examination of pleural fluid smear with Wright's stain and observed the features of the sample under a microscope to investigate the significance of finding Curschmann's spirals (CSs) in pleural effusions. We found a large number of neutrophils alongside with few eosinophils, lymphocytes, and macrophages without cytoplasmic mucin and numerous bacteria. Moreover, a few CSs were also observed, but there were no tumour cells. This study provides evidence of the premise that the inflammation occurring in effusions causes the formation of CSs. Moreover, the presence of CSs proves the presence of glycoproteins and severe chronic inflammation in pleural fluids.

Key Words: *Curschmann's spirals, Inflammation, Pleural effusions.*

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INTRODUCTION

Curschmann's spirals (CSs), first found by Curschmann in sputum samples in 1883, are characterised by a dark core and a translucent periphery.[1-3] They are considered to be acellular structures composed of mucus which is mostly glycoproteins.[4] CSs have typical characteristics with a dark central axis. The edges of the spirals are distinct and smooth. CSs are usually discovered in cytologic specimens from the lower respiratory tract of patients suffering from chronic bronchitis and asthma. We present a case where CSs were found in pleural fluid.

CASE REPORT

A 66-year-old male patient, a known case of gastric poorly differentiated adenocarcinoma, was diagnosed with acute respiratory failure owing to pulmonary embolism after laparoscopic total gastrectomy and Roux-Y oesophagojejunostomy. The tumour histological type was signet-ring cell carcinoma and Lauren's classification was the diffuse type. Intraoperatively, two transection margins were 3 cm and 7.5 cm from the tumour. Additionally, the omentum was not involved in the invasive cancer, and no cancer metastasis was found in 45 lymph nodes. The final pathological staging was pT3 N0 Mx.

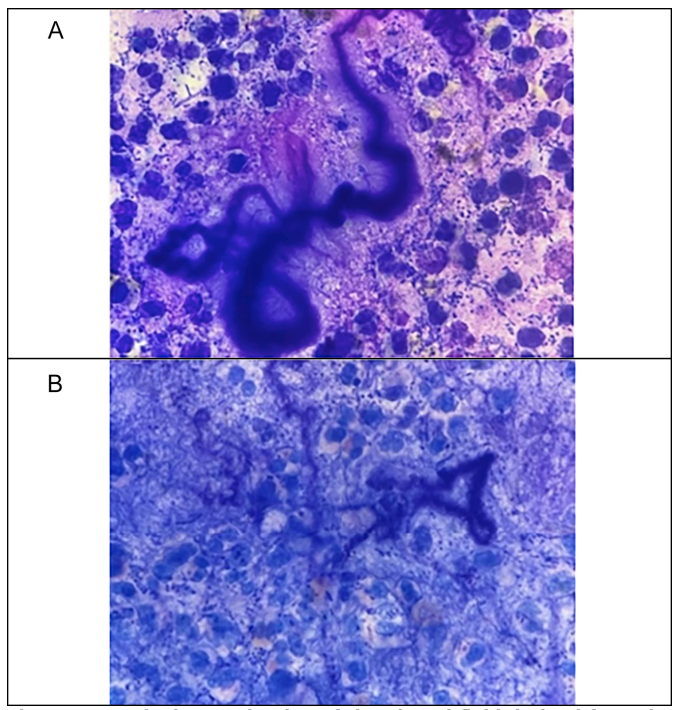

Figure 1: Cytologic examination of the pleural fluid drained from the patient's pleural cavity. (A) CSs present with an elongated and highly coiled structure consisting of a dark core and a translucent mantle. (Wright's stain, ×1000). (B) A large number of neutrophils along with numerous bacteria in the background (Wright's stain, ×1000).

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Table I: The types of cytological samples containing CSs and related diseases.

	Pulmonary alveolar microlithiasis	Asthma or bronchitis	Tuberculosis	Inflammation	Adenocarcinoma	Aetiopathogenesis unknown	Teratoma	Normal
Sputum	+	+	+	-	-	-	-	-
Bronchoalveolar lavage fluids	-	+	-	-	-	-	-	-
Voided urine	-	-	-	-	-	+	-	-
Cervicovaginal secretions	-	-	-	+	-	-	-	+
FNA samples of parotid gland	-	-	-	+	-	-	-	-
Fluids of teratoma	-	-	-	-	-	-	+	-
Pleural and peritoneal effusions	-	-	-	+	+	-	-	-

FNA, Fine needle aspiration, +: Curschmann's spirals (CSs) present, -: No CSs.

Computed tomography (CT) findings revealed the presence of pleural fluid which was drained and sent to the clinical laboratory for analysis. The fluid volume was 13 mL, with a white appearance. Around 10 mL of the fluid was taken and centrifuged for 10 minutes at 1,500 rpm. A total of three smears of sediment were prepared by spreading between the slides after decanting the supernatant. When the slides were dry, the smears were stained by the Wright's stain.

Microscopic cytologic examination showed a large number of neutrophils along with few eosinophils, lymphocytes, and macrophages without cytoplasmic mucin. However, numerous bacteria were detected. The sample was collected with a disposable sterile anticoagulant tube of pleural and peritoneal fluids and timely sent for processing and examination to avoid contamination and bacterial overgrowth. A large number of intracellular bacteria confirmed the existence of inflammation. Moreover, a few CSs were also observed, while no tumour cells were found (Figure 1). Similar to CSs in sputum, the spirals were elongated and highly coiled with a dark core and a translucent mantle. The immunohistochemical staining of the pleural fluid cells showed no tumour cells. Despite receiving aggressive treatment interventions, the patient died of acute respiratory failure.

DISCUSSION

It has been demonstrated by Fullmer *et al.* that CSs are a frequent nonspecific finding in the sputum of smokers.[5,6] However, these are also described in cervicovaginal gynaecologic smears of asymptomatic non-smoker females.[5] In addition, there are also reports of a few cases found in urine, pleural and peritoneal effusions, and parotid glands (Table I). Both Naylor[7] and Wahl[8] had found CSs in spontaneously occurring pleural and peritoneal effusions. Wahl observed CSs in 12 specimens of 334 peritoneal and pleural fluids with a prevalence of 1 in 28,[8] while Naylor demonstrated the prevalence to be 1 in 3,300. The technological progress and methods of preparing the smears seem to explain the differences. In five cases reported by Naylor,[7] three of the pleural and peritoneal fluids contained mucus-secreting adenocarcinoma cells while the other two cases had the inflammation of serosa, which indicated that CSs seen in effusions were related to mucus in adenocarcinoma and serosal inflammation.

In this case, the patient did not smoke and there was no history of chronic bronchitis, asthma, or tuberculosis. The serosa was not involved by any neoplasm and no tumour cells were found in the pleural fluids. Only a few CSs along with a lot of neutrophils and bacteria were observed. It seems that the CSs formed in pleural fluid were attributable to serosal inflammation. This critical finding provides evidence of the premise that the inflammation occurring in effusions causes formation of CSs. The CSs are mainly formed by glycoproteins which proves the presence of glycoproteins in pleural fluids even though Wright's stain does not detect these glycoproteins. In addition, the formation of CSs takes some time which is confirmed by the presence of chronic inflammation rather than external bacterial contamination. The presence of CSs in the pleural fluids may indicate severe inflammation. The CSs formed from submesothelial connective tissue mucosubstances that enter the serosal cavity through a mesothelium with increased permeability because of the inflammation.[5,9] Numerous neutrophils and bacteria in pleural fluid also showed a serious infection. However, further investigations and more cases are needed to clarify the relationship between the CSs and inflammation.

ETHICAL APPROVAL:

All procedures performed in this study were in accordance with the ethical standards of Qingdao Women and Children's Hospital, Affiliated to Qingdao University. Written informed consent was obtained from the patient for the publication of this case report and accompanying images.

PATIENT'S CONSENT:

Informed consent was obtained from the patient to publish this case.

COMPETING INTEREST:

All authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

ZW: Conceived the idea.
XL: Wrote the original draft.
XL, JS, WL, ZW: Collected the literature data.
All authors approved the final version of the manuscript to be published.

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