Cytology of Diffuse Mesothelioma in the Thorax of a Horse

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INTRODUCTION

CYTOLOGICAL examinations of fluids obtained by paracentesis of the abdominal and thoracic cavities are valuable diagnostic aids. Mesothelial cells line both cavities and are normally found in fluid obtained from them. In peritonitis or pleuritis, mesothelial cells undergo a transformation or activation and their morphology changes. The change in morphology results in a cell form which requires careful differentiation from neoplastic cells (Spriggs and Boddington, 1968; Roberts and Campbell, 1972). This is a report of the ante-mortem cytological examination of thoracic fluid obtained from a horse with a diffuse mesothelioma.

CASE HISTORY

A large 13 year old Quarterhorse mare was presented with a history of malaise for the past week. Physical examination revealed dullness of heart sounds, but no other remarkable signs. Haematological analyses, blood gas determinations, plasma electrolytes, calcium, inorganic phosphate, blood urea nitrogen were unremarkable.

Thoracentesis produced a large volume of cellular fluid with a total protein concentration of 3.3 g/100 ml and no clot formation. A total of 14.5 l fluid was drained from the thorax. Cytological examination of Wright's stained preparations of the fluid revealed numerous pleomorphic mesothelial cells with a few neutrophils and macrophages. Attempts to culture bacteria from the fluid were unsuccessful.

CYTOLOGICAL EXAMINATION

The pleomorphism of mesothelial cells ranged from cells containing 3 or 4 nuclei, to more differentiated cells forming pseudomembranes. Many multinucleated cells were arranged in polyps of 50 or more cells (fig. 1). Other groups of cells formed spheres with solid centres. Frequently cells were arranged in series joined together by cytoplasmic bridges in which there appeared to have been cytoplasmic streaming (fig. 2). Reports concerning the cytology of mesotheliomas in humans indicated polyp formation to be typical, whereas with hollow centres or acini are more characteristic of adenocarcinoma (Spriggs and Boddington, 1968). Normal thoracic fluid or fluid from pleuritis may contain 4 or 5 cells per clump. But we have not seen the large polyp formations, chains of cells or the great range of pleomorphism observed in this case in thoracic fluid obtained from horses with pleuritis or peritonitis.

The cytoplasm of the mesothelial cells was finely granular and stained dark blue with Wright's-Giemsa stain. Various sizes of unstained vacuoles distended some cells to the point where the cells appeared adenomatous. Small, clear vacuoles are common in mesothelial cells associated with pleuritis and peritonitis, however, in this case some vacuoles occupied 70 per cent of the cells. Glycogen granules are common in normal cells and are small and uniform in size and stain by the periodic acid Schiff's method (PAS). Large vacuoles in cells of adenocarcinomas contain glycoproteins and also stain with PAS but the large vacuoles in this case did not. Cells were then treated with malt diastase, which digests glycogen but not glycoprotein, and then PAS stained. The small vacuoles no longer were PAS stained, indicating that the vacuoles contained glycogen and not a glycoprotein. When tissue sections were prepared for histological examination following necropsy no PAS staining material was observed within the cells. Variation in PAS staining of mesothelial cells has been the topic of discussion by other authors (Roberts and

Fig. 1. Polyps of cells found in thoracic effusion of a horse with diffuse mesothelioma. Cells were stained with Wright's-Giemsa stain.
Mesothelial cells linked together with cytoplasmic bridges in which there appeared to have been streaming of cytoplasm between cells. Cells are stained with Wright’s-Giemsa stain.

Campbell, 1972). The apparent inconsistency observed in the PAS staining of the cell impressions versus the histological sections may be the result of glycogen extraction by warm alcohol during dehydration of the tissue for paraffin embedding.

POST-MORTEM EXAMINATION

As the result of the diagnosis of mesothelioma and the accompanying poor prognosis euthanasia was carried out. Post-mortem examination revealed bilateral involvement of the pleura with villus polyps diffusely covering visceral and parietal pleura. Examination of other organs of the horse did not reveal any other lesions from which cells of the mesothelioma could have metastasized to the thorax. Thus the thoracic pleura was considered the primary origin of the neoplasia. Histopathological examination of areas of the lesion revealed areas on the pleura in which there was transformation of pleural membrane from a single layer of mesothelial cells to multiple cell layer with polyp formation (figs. 43 and 4).

There was congestion of the lung parenchyma adjacent to the mesothelium and a single small site of neoplastic invasion was noted in the lung parenchyma.

DISCUSSION

Previous reports of mesotheliomas in other species are consistent on one point; there is no well-defined line of demarcation between the morphology of benign and neoplastic mesothelial cells (Roberts and Campbell, 1972; Spriggs and Boddington, 1968). Cellular arrangement and a wide range of pleomorphism are better guides to neoplasia of mesothelial cells than the established nuclear chromatin patterns of neoplasia used for other types of cells. Differentiation of the more common adenocarcinomas from mesotheliomas can be nearly as difficult as the initial diagnosis of neoplasia. In general the differentiation is based on the presence of glycoprotein in secretory vacuoles of cells from adenocarcinomas. Both neoplasms can produce large volumes of fluid.

SUMMARY

Examination of effusions from body cavities must include a search for neoplastic as well as inflammatory cells. Neoplastic cells found in the thorax are generally derived from adenocarcinomas or mesotheliomas: Mesotheliomas are relatively uncommon and the neoplastic cells found in effusions are difficult to differentiate from activated cells in inflammatory effusions. An ante-mortem diagnosis of mesothelioma was made in a mare on the basis of the large volume of fluid produced, the pleomorphic mesothelial cells, the polyp formation and the absence of PAS staining material after digestion of the cell impression with maltase diastase.

RÉSUMÉ

L'examen des liquides provenant des cavités internes devrait comprendre une recherche des cellules neoplasiques autant que celle des cellules inflammatoires. Les cellules neoplasiques trouvées dans le thorax proviennent généralement d'adénocarcinomes ou de mesothéliomes. Les mesothéliomes sont généralement peu courants et les cellules neoplasiques qui en proviennent sont difficiles à différencier des cellules provenant de liquides inflammatoires.

On a diagnostiqué un mésothéliome du vivant de l'animal sur les bases suivantes:
1° grande quantité de liquide recueilli
2° cellules mésothéliales pleomorphiques
3° formation de polypes et absence de matériel colorable au PAS après digestion des cellules par la maltase.

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REFERENCES

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ABSTRACT
Surgery
Intestinal Surgery in the Foal

This paper records the authors' experience over a period of almost 30 years, of intestinal surgery in foals. The main criterion for laparotomy is considered to be severe colic of sudden onset in which the pain cannot be relieved. Cases of persistent, unaccountable, clinical signs of intestinal origin also merit surgical exploration.

Pentobarbitone sodium is recommended for the induction of anaesthesia which is maintained with oxygen, halothane and possibly nitrous oxide delivered from a vapouriser through an endotracheal tube.

The recorded causes of colic treated surgically include pyloric stenosis, duodenal stricture, intussusception, caecal tympany, anal anomalies, neonatal exsanguination and ruptures and hernias. The main indication, however, was volvulus of the small intestine which is attributed to hypermotility of the gut. The most usual site is the terminal ileum and the most common age of affected animals is 2-4 months. The major predisposing cause appears to be the ingestion of spring grass at a critical stage in development of the foal's digestive system. The ileum is principally affected because of its relatively fixed mesenteric suspension. The condition is sudden in onset and causes acute, severe pain without remission. After a period of rolling, affected foals characteristically lie in dorsal recumbency propped against a wall with the neck curved towards one side. The abdomen is not distended at the onset of symptoms but tympany soon develops. The failure of relaxant, sedative and analgesic drugs to provide relief in cases of volvulus differentiates the disorder from acute flatulent colic which also occurs in foals of this age. In cases of bowel rupture, the pain is much less severe and the clinical signs are more of toxaemic shock. Surgery is justified in foals with progressive clinical deterioration for more than 4 hours. In describing the operative technique, the authors emphasise the importance of gentle and minimal handling of the bowel, and advocate closure of the distal stump and anastomosis of the ileum or jejunum to the caecum if the volvulus is irreducible or the bowel inviable. Supportive therapy includes the use of neostigmine after relief of the obstruction but before recovery from anaesthesia, in order to stimulate peristalsis.

Acute intussusceptions, which are clinically indistinguishable from volvulus and result from the same cause, also affect the lower ileum and are usually reducible. The subacute form was seen as a sequel to diarrhoea and caused vague signs of dull, intermittent pain, often with grinding of the teeth.

Anal anomalies are not uncommon in Thoroughbred foals and must be distinguished from retention of meconium. Anal atresia is satisfactorily treated with a simple cruciate incision under local anaesthesia, without suturing. More extensive defects such as absence of the small colon, have a poor prognosis.

Commenting on hernias, the authors reiterate that scrotal hernias, which occur more frequently in heavy breeds than in the Thoroughbred, resolve spontaneously and seldom require surgery. Similarly, surgery was not found necessary in cases of meconium retention for which the use of sedatives with bowel relaxant properties is recommended.

The overall recovery rate in this series of laparotomies was just less than 50 per cent. The technique was always found to be helpful in the management of the cases concerned but the authors emphasise that prompt action is essential for success.