

PRODUCTION NOTES

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Article Type: Short communication

Journal Section: Production animals

Layout Instructions

Figures: 3

Tables: 0

Word Count (approx.): 1250

Sudden death of a crossbred calf associated with a myocardial adenomatoid tumour

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The only lesion found in a cross-bred calf that died suddenly was a rare tumour in the myocardium of the left ventricle. The mass appeared similar to tumours discovered incidentally in the hearts of abattoir specimens in Italy, described as adenomatoid tumours. These are bimorphic tumours presumed to have a mesothelial origin.

Conclusion Although in a published study from Italy these tumours were considered incidental and clinically unimportant, I suggest that in this case the mass may have interfered with cardiac conduction, causing sudden death of the calf.

Keywords adenomatoid tumours; cardiovascular system; cattle

A case of sudden death in a crossbred calf is presented, with a review of the differential diagnosis based on histopathology.

History

The subject was a Simmental × Angus steer aged 10 weeks, which had been castrated and vaccinated with 5-in-1 clostridial vaccine at 1 week of age. The animal was observed to be clinically normal and playful in the morning, but was found dead several hours later. There were no signs of struggle in the pasture surrounding where the calf was found. The calf was one from a herd of crossbred calves together with Simmental cows that were grazing short summer pastures, their diets supplemented with grass hay. Animals had free access to a salt lick and had been grazing the same pasture over the summer period. They had access to rainwater stored in tanks piped by gravity to concrete water troughs. No other cattle were ill at the time or subsequently; there was no known access to toxic plants and the weather at the time was fine, mild and clear.

Necropsy findings

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: [10.1111/avj.12703](https://doi.org/10.1111/avj.12703)

At postmortem examination, the calf was in excellent body condition (score 4/5), there was watery fluid in the distal ileum and caecum and a pale irregular firm mass in the interventricular myocardium, which protruded into the left ventricle underneath the mitral valve (Figure 1). Other than this focal mass, which was approximately 16 mm in greatest dimension, the cadaver was unremarkable.

Laboratory results

Cultures of the ileum and colon grew only mixed normal enteric flora. A total worm count showed no worms identified from abomasal content and 30 *Cooperia* spp. and 150 *Nematodirus* spp. from the small intestine.

Histopathology

The only significant lesion identified in examination of all major organ systems was the mass in the heart noted at postmortem. This mass consisted of irregular anastomosing channels lined by a contiguous plump, oval to spindle cells separated by an apparently separate population of pale intersecting fascicles of spindle cells (Figure 2). The mass was poorly circumscribed and appeared to encroach into adjacent myocardium, but necrosis or inflammation was not apparent at the margins of the tumour. Excessively fluid content noted at the time of postmortem in the ileum and caecum was not accompanied by any histological changes in samples taken from those regions of the bowel.

Special stains. The tumour was variably positive with cytokeratin, with especially strong staining of the cells lining the channels in the mass (Figure 3). Vimentin stains were also positive for both tissue components and smooth muscle actin showed positive staining only for the spindle cell component of the tumour. von Willebrand's factor and desmin stains were negative, although the internal controls of the vascular elements in the mass and adjacent myocardium stained appropriately. Based on these staining characteristics, a tumour of mesothelial cell origin was considered most likely and a search of the literature identified a publication from Italy where masses described as adenomatoid tumours had been found rarely in cattle hearts at slaughter.¹ Therefore, immunostaining for additional markers of mesothelial cells was attempted, based in part on those used in the published study, but some immunoreagents were not available and others, including calretinin and CK5/6, have not been validated for use in cattle and internal controls were not positive. There was weak nuclear and perinuclear cytoplasmic staining of the tumour with WT-1, a marker of a tumour suppressor protein expressed in a diversity of different human tumours, including Wilms tumour (nephroblastoma), tumours of the reproductive tract and mesothelial tumours.

Discussion

The mass identified in this calf appeared on routine histopathology to be the same as those described as adenomatoid tumours in a series of cattle from Italy,¹ identified as incidental lesions in animals at slaughter. The immunohistochemical staining results in the present case were consistent with a tumour of bimorphic mesothelial origin, as previously described. Histological confirmation that tumours have a mesothelial origin remains complex and there is no single marker available that provides unequivocal proof.²

Although there is some resemblance in this tumour to histological variants described for human nephroblastoma (Wilms tumour) in young children and the tumour did show weak expression of WT-1, this marker is expressed in many tumours; the spindle cell component is consistent with mesothelial cells that show smooth muscle characteristics and the cells lining

trabecular spaces did not form primitive glomerular structures. The cells lining the irregular spaces stained with both vimentin and cytokeratin, as expected for bimorphic cells of mesothelial origin. These staining characteristics alone are not diagnostic because a range of primitive germ cell tumours can also co-express markers for cytokeratin and vimentin. Although the cause of the death in this calf remains uncertain, it seems probable that the tumour may have interfered with normal patterns of cardiac conduction, particularly given its location close to the atrioventricular node, and perhaps it led to sudden heart failure. The evidence suggested that the calf died suddenly and without a struggle. It was from a small herd of cows and calves that had grazed on the same pasture for months, there had been no new introductions and forage was limited to short summer pasture with no known access to toxic plants, supplemented with grass hay ad libitum from a feeding station. Water was supplied in concrete troughs piped from rainwater collected and stored in large plastic storage tanks. No source of potential intoxication was identified to explain the death of this animal and all other cattle in the herd remained clinically normal. In the published study of adenomatoid tumours of cattle, these rare tumours were discovered at slaughter and considered incidental, but it is possible that the unusual tumour identified in heart of this calf may have caused its death.

Acknowledgments

The author thanks Paul Benham and Faye Docherty, Histopathology Laboratory, Veterinary Clinical Centre, Werribee, for preparation of routinely stained sections from this case and also a panel of immunostains used on sections from the tumour, and Dr Mark Williamson, Gribbles Veterinary Pathology, Clayton, for provision of tumour sections stained with calretinin, CD5/6 and WT-1.

Conflicts of interest and sources of funding

The author declares no conflicts of interest or sources of funding for the work presented here.

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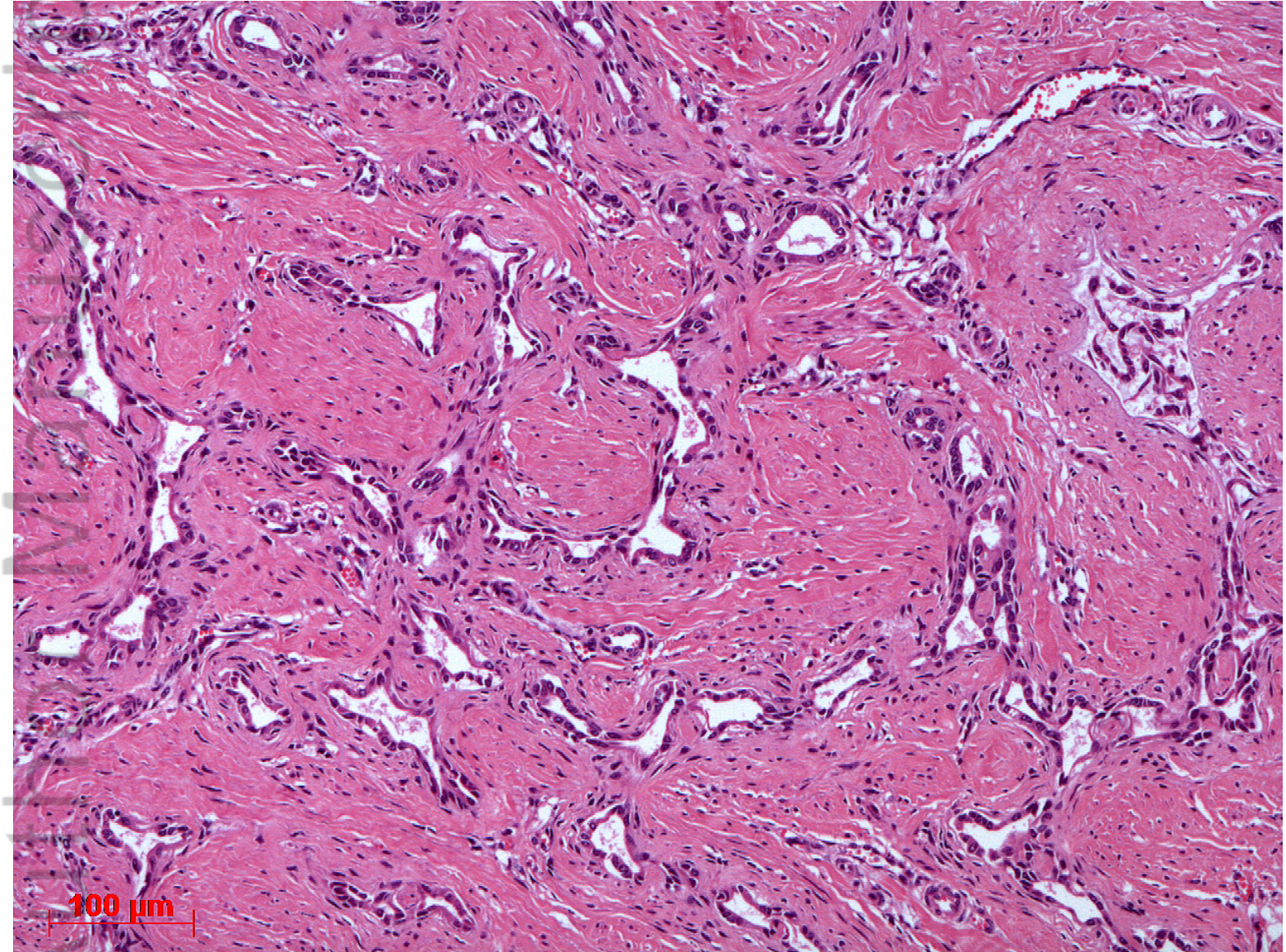
Figure 1. Photograph of fixed myocardial tissue containing the mass. The fine irregular channels are apparent as clear spaces. The tumour is not encapsulated and infiltrates the surrounding myocardium.

Figure 2. Photomicrograph of the myocardial mass. The inset shows the tumour margin with residual small groups of myocardial muscle cells still present. (H&E, bar = 100 µm.)

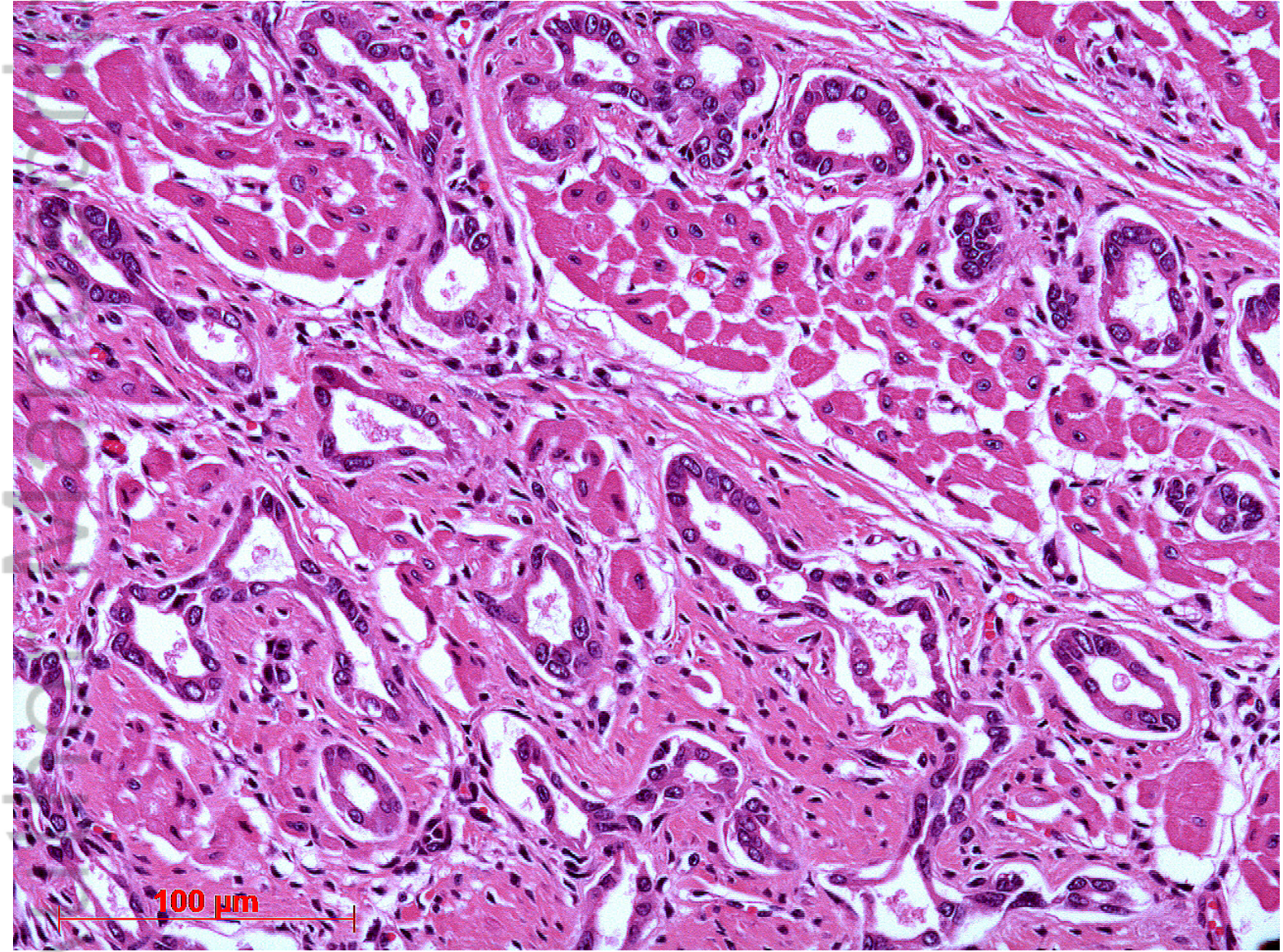
Figure 3. Photomicrographs of the myocardial mass in a calf that died suddenly, showing immunostaining reactions for cytokeratin (a), vimentin (b), smooth muscle actin (c) and WT-1 (d). All sections are at the same magnification; bar = 100 µm.



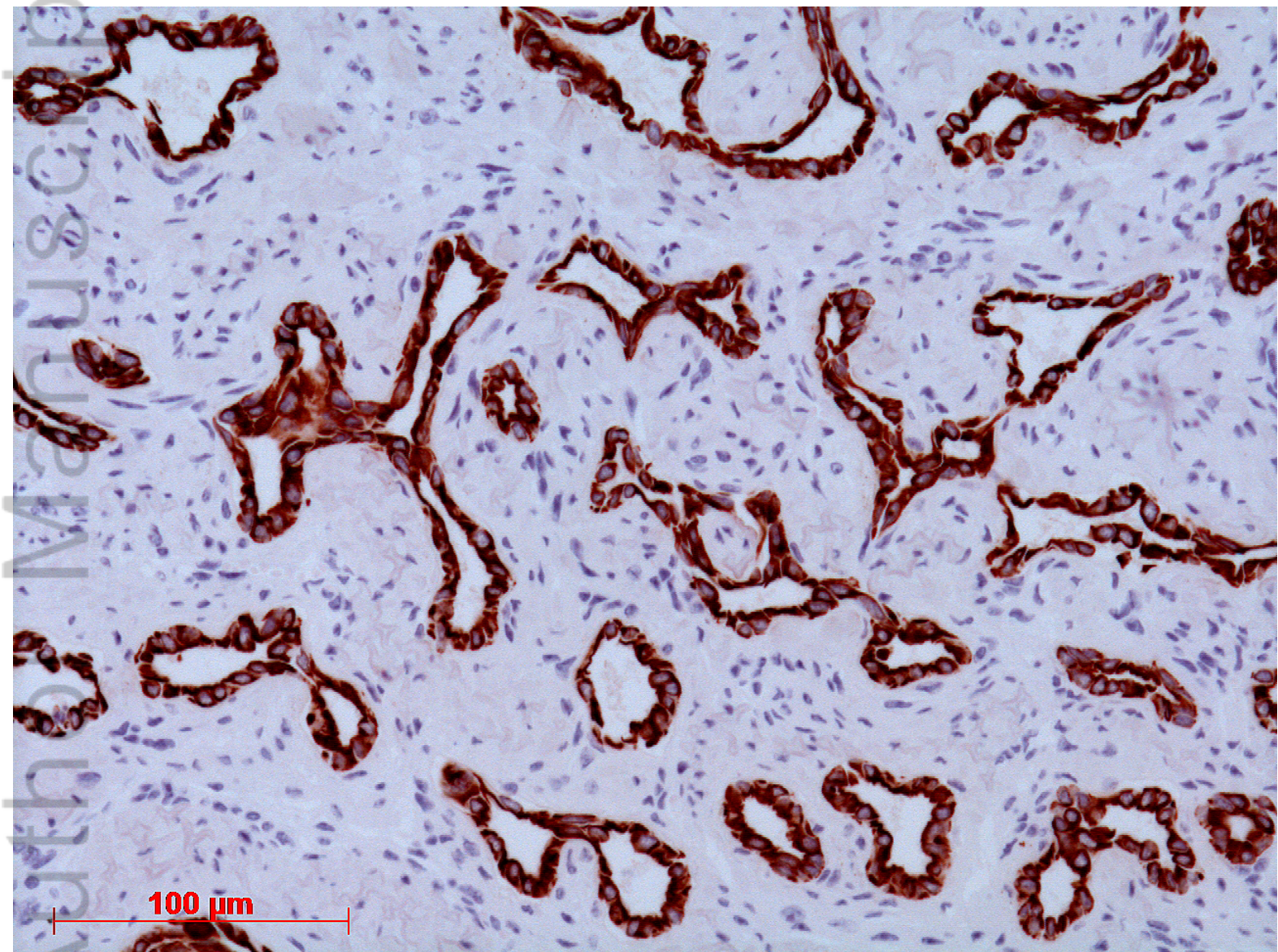
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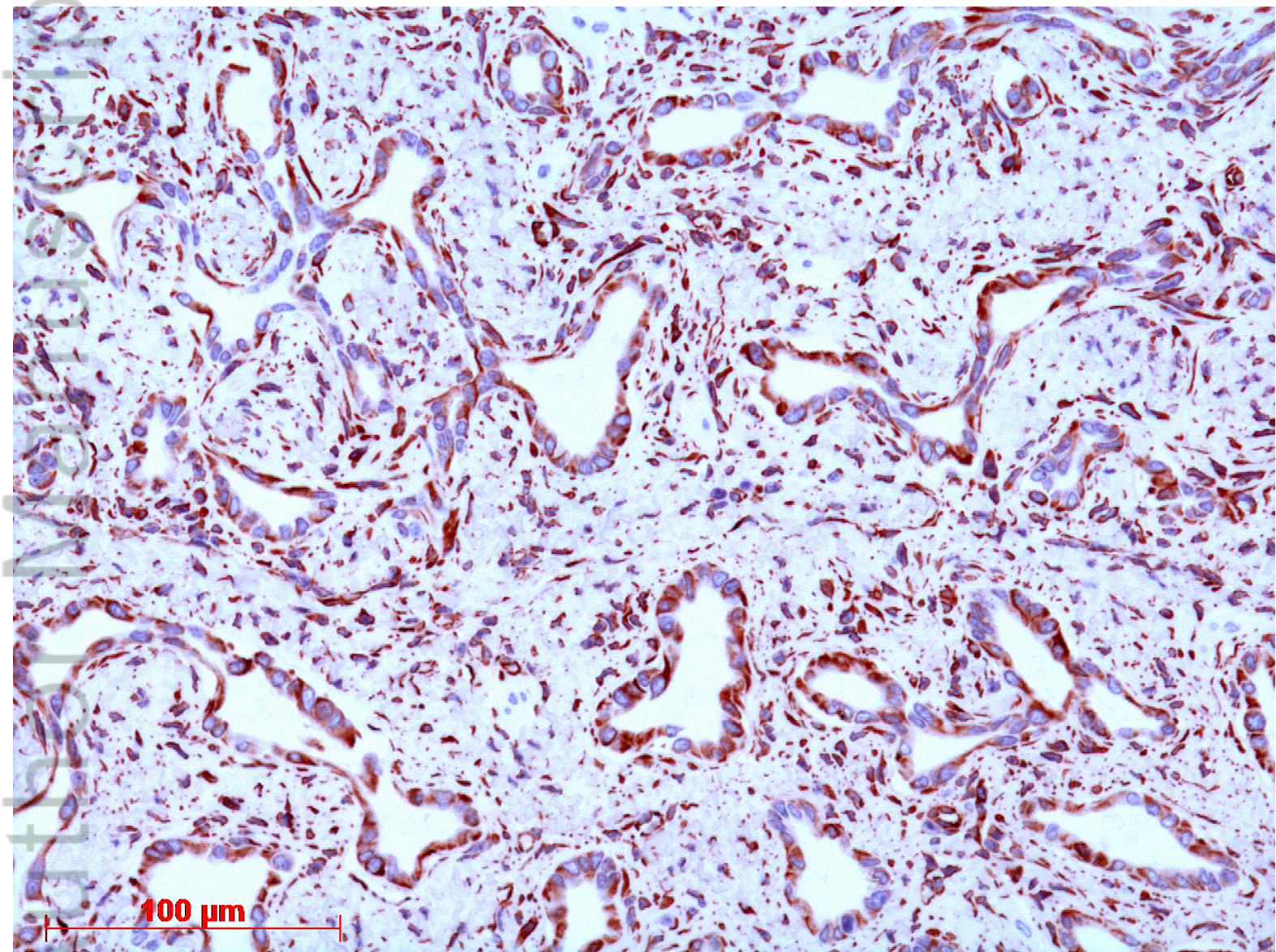
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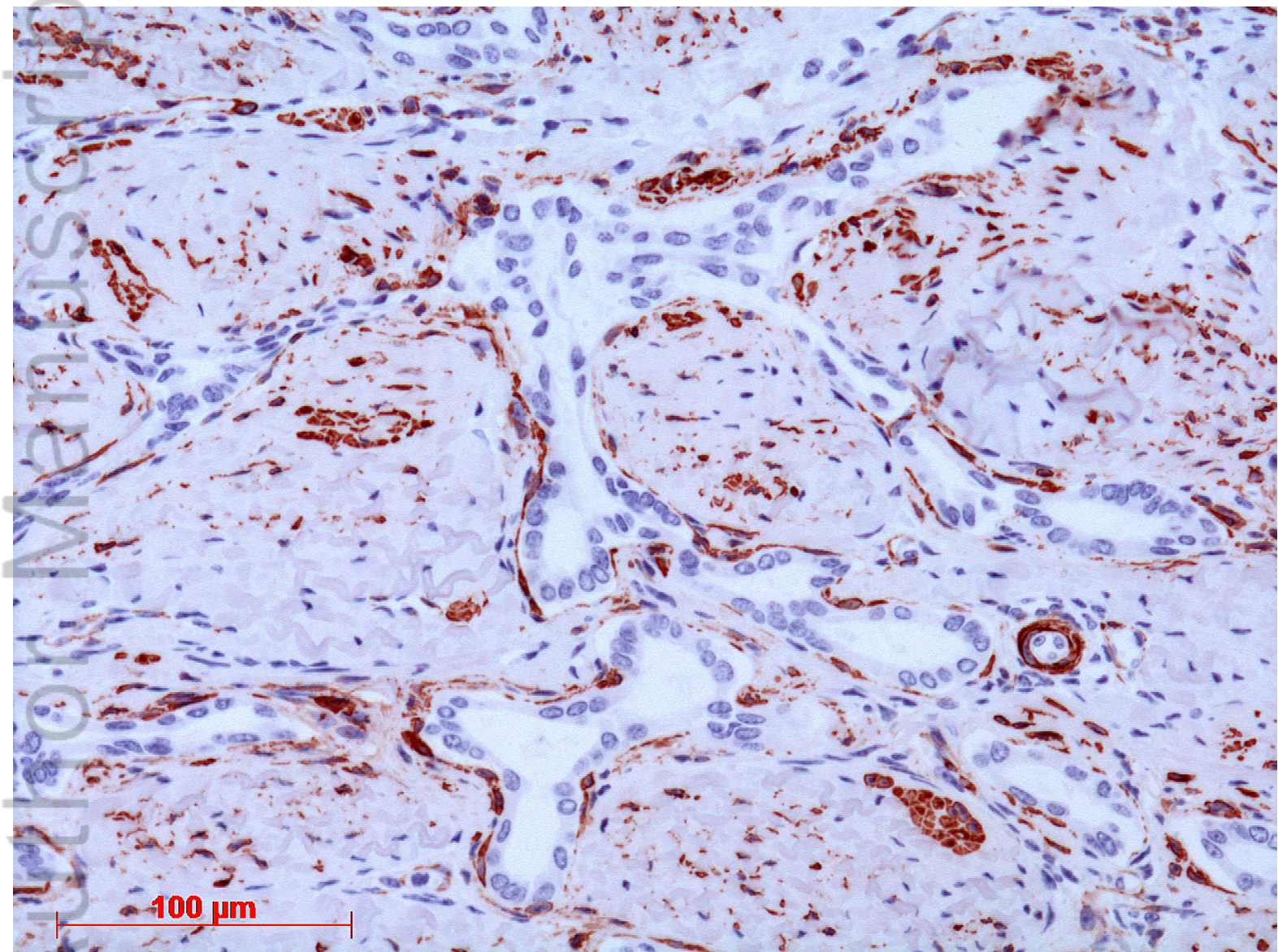
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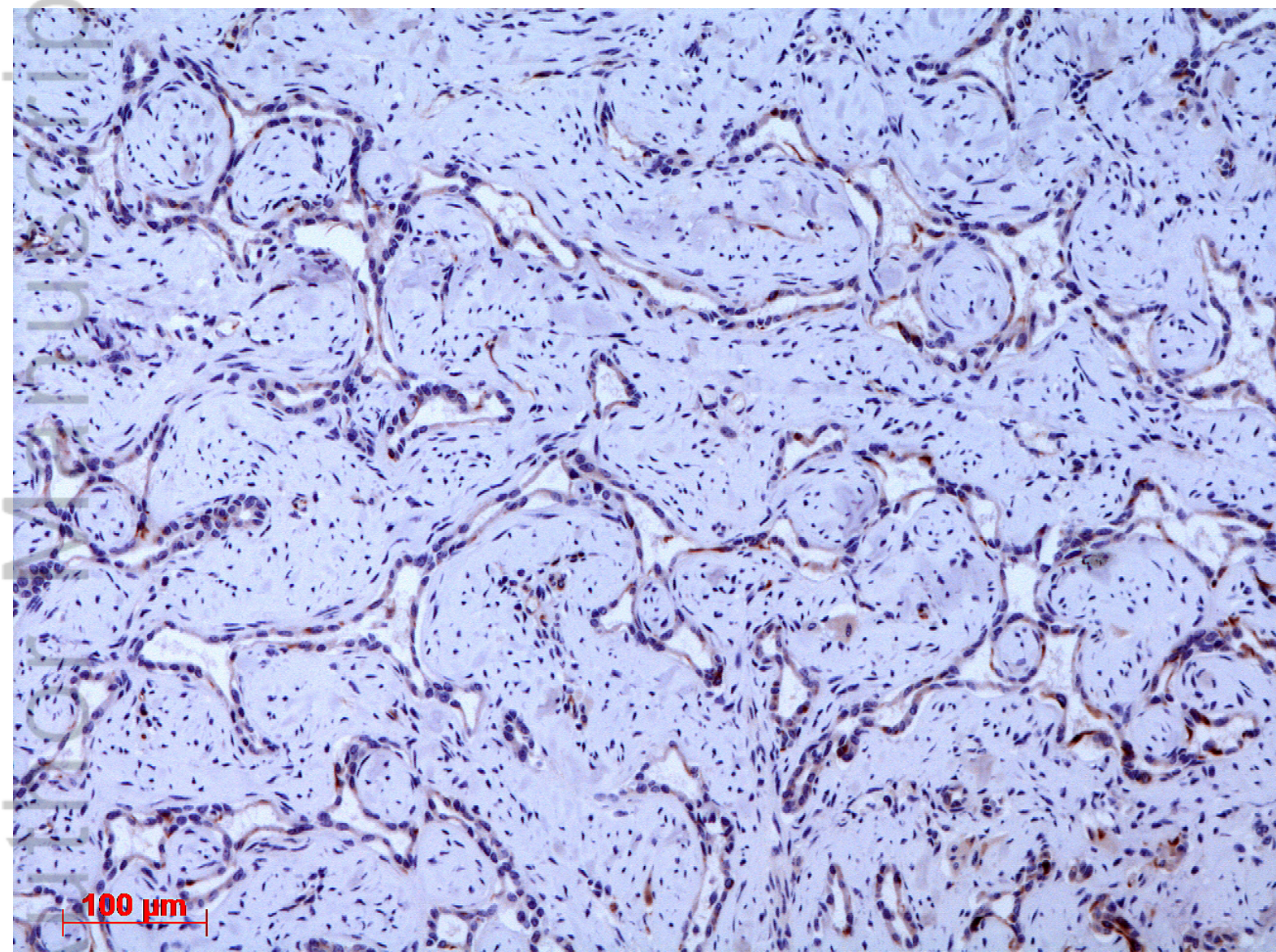


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