Never Say Never: Sectioning Tissue Samples with Metal Implants

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Introduction

Sectioning tissue with large metal implants included is a challenge in histology. Using common microtomes with paraffin or resin embedded samples damages the used blades. Also artefacts will be produced by the implant itself, which might be shifted by the blade inside the sample during the process of cutting. These problems are known from cutting blood vessels with stents. These implants e. g. can be cut as they are very thin in diameter but produce the described artefacts.

Resin histology allows to overcome these problems by preparing ground sections, but this method cannot produce serial sections. The ROWIAK TissueSurgeon offers a new method to prepare serial sections of soft tissue with metal implants by cutting around them. The area of interest, the implant tissue interface, will be preserved with this method.

Material and Methods

Murine skin tissue with titanium implants embedded into MMA were used to test serial sections with the ROWIAK TissueSurgeon. Samples were originally used for ground sections so a flat surface for mounting the sample to a microscope slide was already prepared. Aforementioned surface was stained with McNeal staining (Tetrachrome, Tolluidin Blue and Basic Fuchsin, Fig. 1) and mounted on a microscope slide. Sections were prepared with ROWIAK TissueSurgeon at 10 µm thickness. The implant, which was not cut and protruded from the surface was ground after two sections to obtain an even surface again.

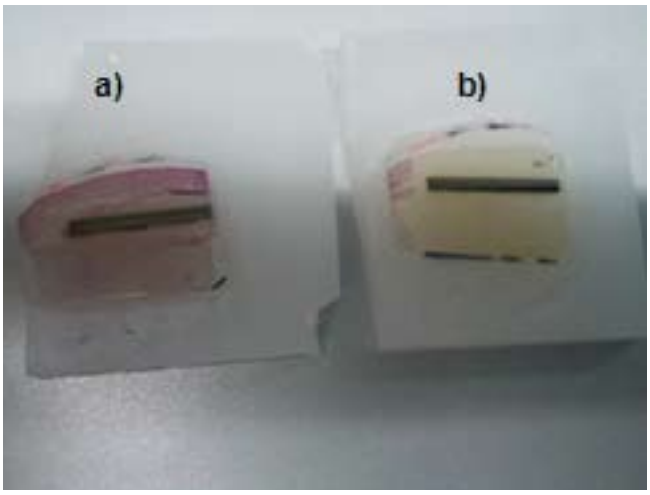

Fig. 1: MMA-embedded skin samples with titanium implants. Surface was stained (McNeal, a) and mounted on a microscope slide. After sectioning the stained surface is removed (b).

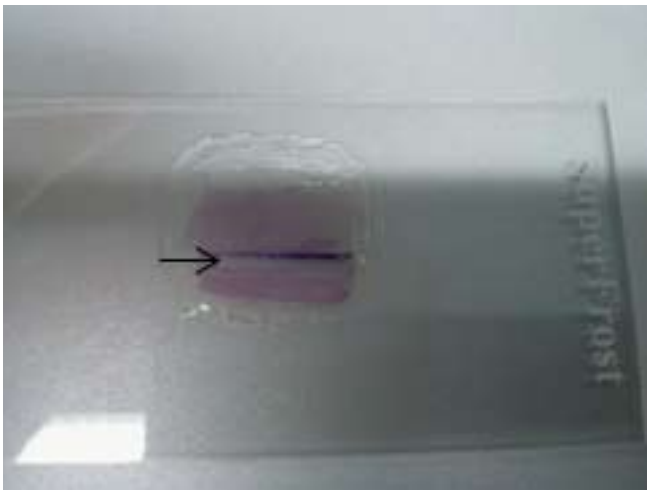

Fig. 2: Stained section (10 µm) of Fig. 1, remaining on the microscope slide, after excess end is removed. Note the gap, where the implant was located (→).

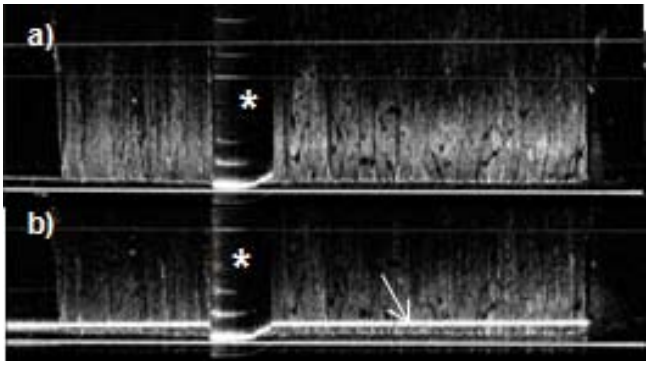

Fig. 3: OCT-images of MMA-embedded skin with titanium implant (*) before (a) and after (b) sectioning. Note the section line (→).

Results

Sectioning MMA-embedded murine skin with titanium implant results in histological samples of very good quality. Staining can be performed before sectioning at the surface of a sample (Fig. 1a) or on the surface of a sample after sectioning without any difference in quality. OCT shows the structure of murine skin with the location of the implant (Fig. 3a). Success of section is controlled via OCT (Fig. 3b, distinct white line). The implant is not sectioned and remains on the excess end of the sample.

The sections are of equal quality (Fig. 4) compared to common histology. The implant tissue interface is illustrated in detail, though the implant itself is missing in the section.

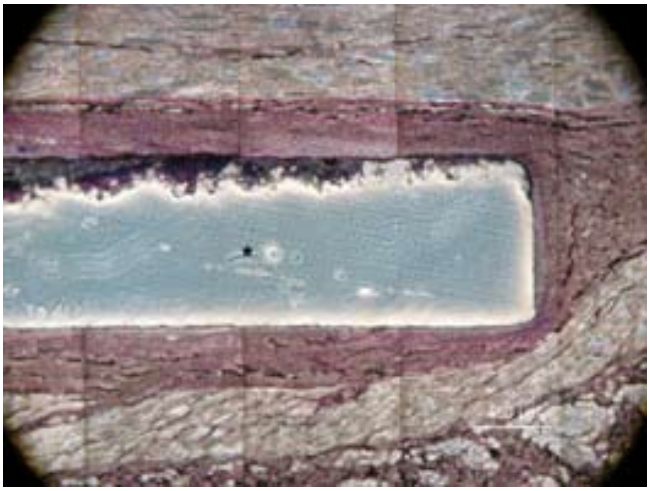

Fig. 4: Histological section of MMA-embedded murine skin sample. Note the implant tissue interface. The location of the implant shows a gap (*).

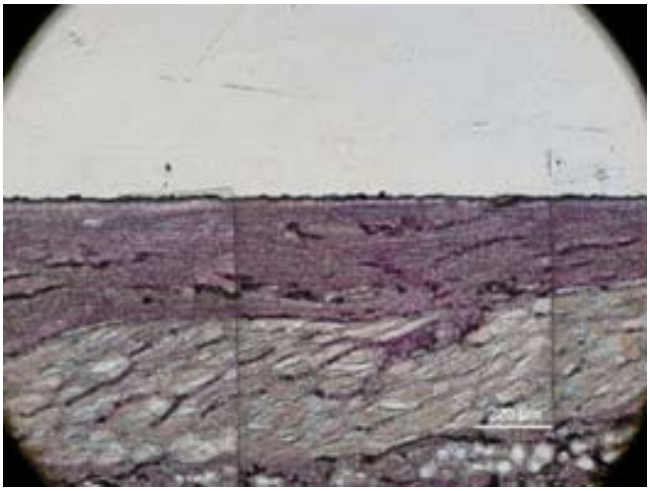

Fig. 5: Detail of Fig. 4, Structure of Implant tissue interface is distinct.

Conclusion

For the first time it is possible to prepare serial sections of embedded soft tissues with large metal implants. The ROWIAK TissueSurgeon is an excellent tool to prepare histological sections of such samples with the ability to cut around implants. The implant tissue interface is preserved and can be analyzed in serial sections without artifacts known from common microtomy.