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The procedure of sinus grafting is an accepted technique for the generation of viable bone in the sinus cavity for successful implant placement.

In this case study we report the comparative bone regeneration capability, using histological techniques, of an irradiated cancellous human bone (Rocky Mountain Tissue Bank, US) versus a synthetic composite of tricalcium phosphate and calcium sulphate (Fortoss Vital, Biocomposites, UK), when used in a bilateral sinus graft procedure.

A male smoker, aged 53, presented with pneumatised sinuses (Figure 1). A bilateral sinus graft was performed using the modified Caldwell-Luc technique. Irradiated cancellous human bone from a commercial bone bank was placed in the right hand sinus, and the synthetic composite was placed in the left hand sinus. Healing was uneventful in both sides. The patient was assessed at six months post surgery (Figure 2). X-ray results indicated suitable bone augmentation for the proposed implantation of three implants placed on each side. At the time of implant placement, core biopsy samples were taken, one into each site of augmentation material implantation. The diameter of core samples taken was 3mm.

It was noted that the core from the right hand sinus (human bone) was soft and broke into two fragments on removal from the core drill, whilst the left hand sinus (synthetic graft) core exhibited firm integrity.

The core biopsy samples were immediately fixed in formalin, and then processed for histological evaluation by embedding in glycol methacrylate with subsequent 4µm thick sectioning. Tissue sections were tincturally stained using Von Kossa and Van Gieson.

The biopsy from the site implanted with synthetic composite material demonstrated the presence of bone in close apposition, or completely surrounding the graft material. The new bone present at the site was mineralised (Von Kossa) and contained collagen (Van Gieson), which histopathologically appeared to be normal healthy bone; equivalent to bone in the upper sinus (Figures 3, 4 and 5).

The biopsy from the site implanted with irradiated bone demonstrated little new bone generation, indicated by small amounts of mineralisation and collagen tissue (Figures 6 and 7).

In this challenging case, the synthetic graft material proved more effective for bone generation in the sinus graft procedure than the irradiated human cancellous bone. The use of the synthetic composite material as an effective alternative to allograft tissue warrants further application specific study.

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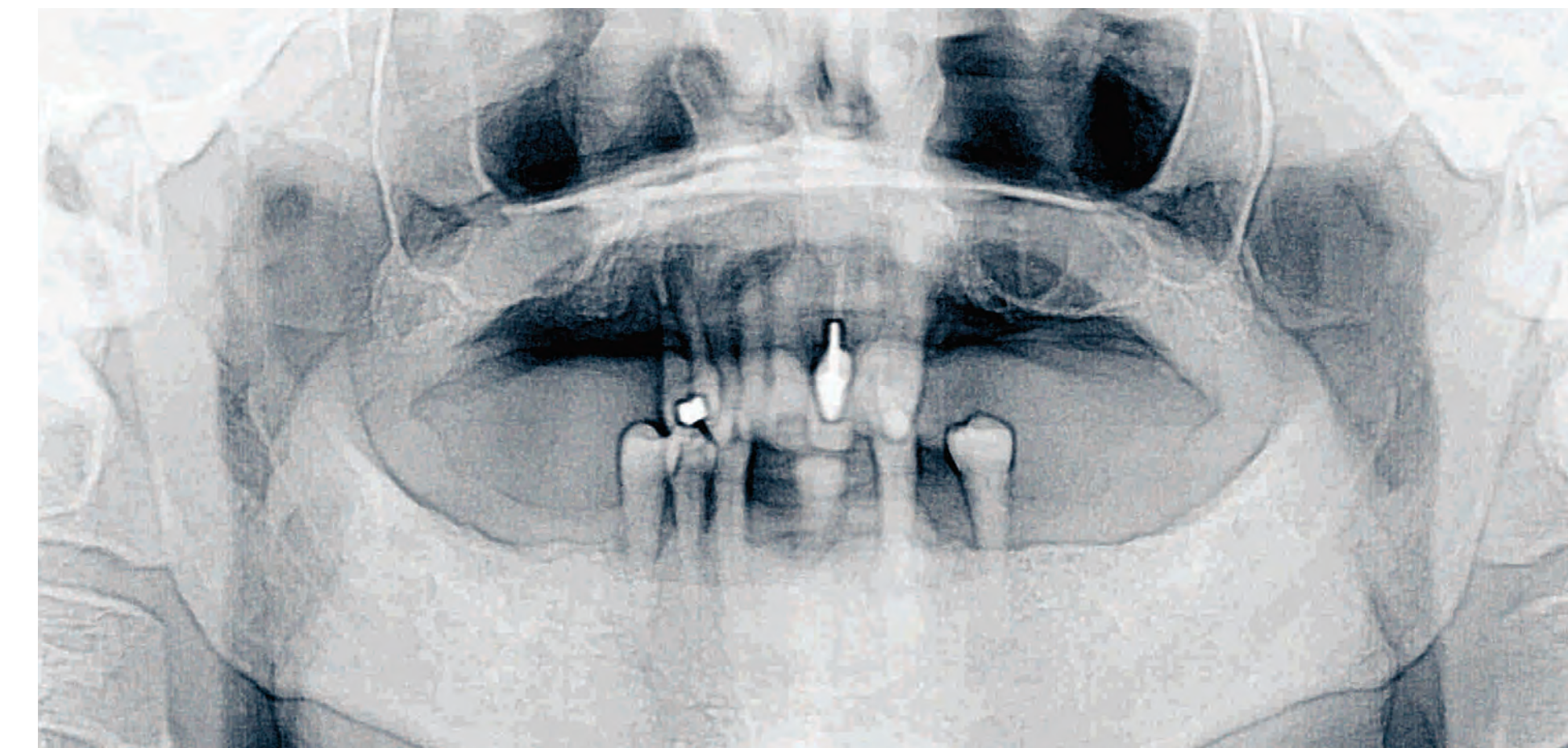


Figure 1. X-ray prior to graft placement, with pneumatised sinuses evident

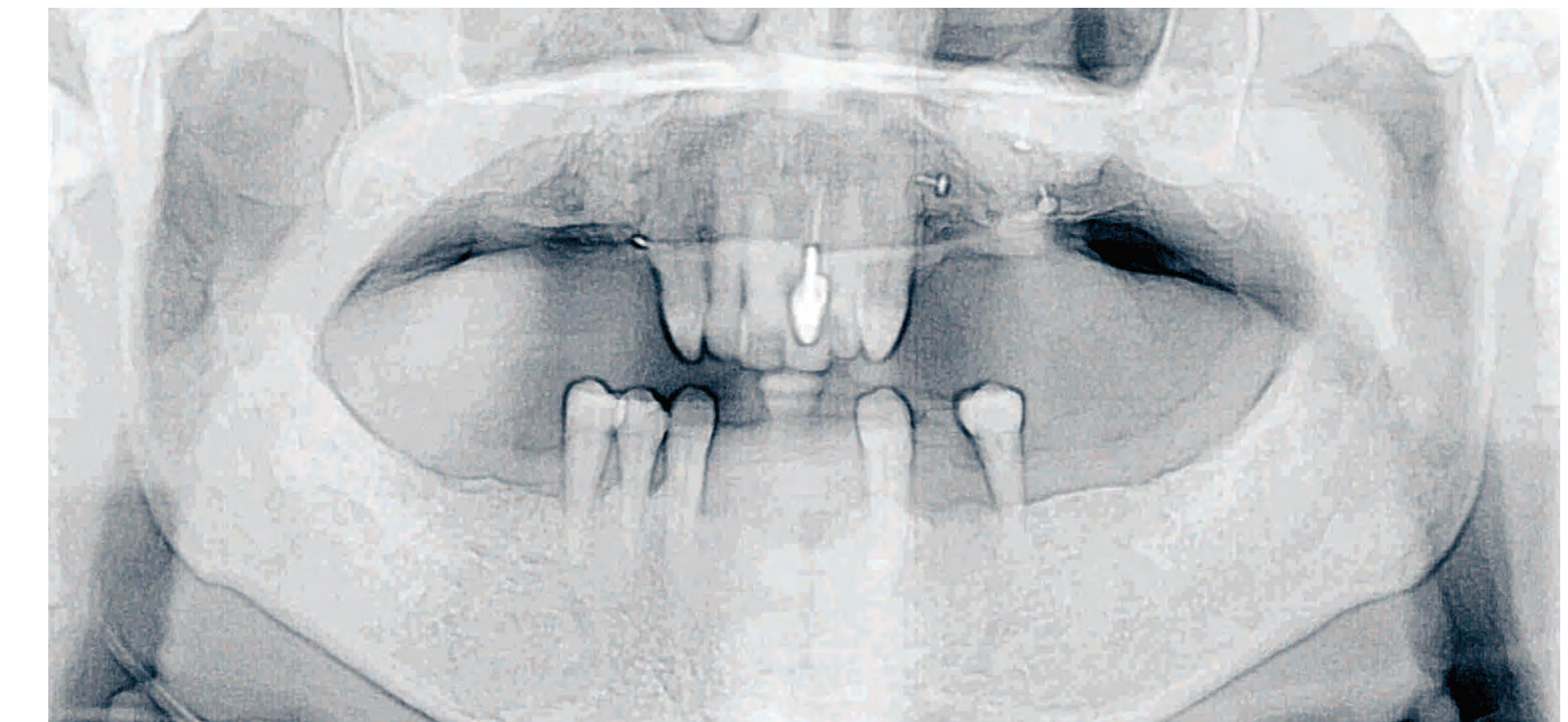


Figure 2. X-ray at 6 months post graft placement

## Synthetic Graft Site

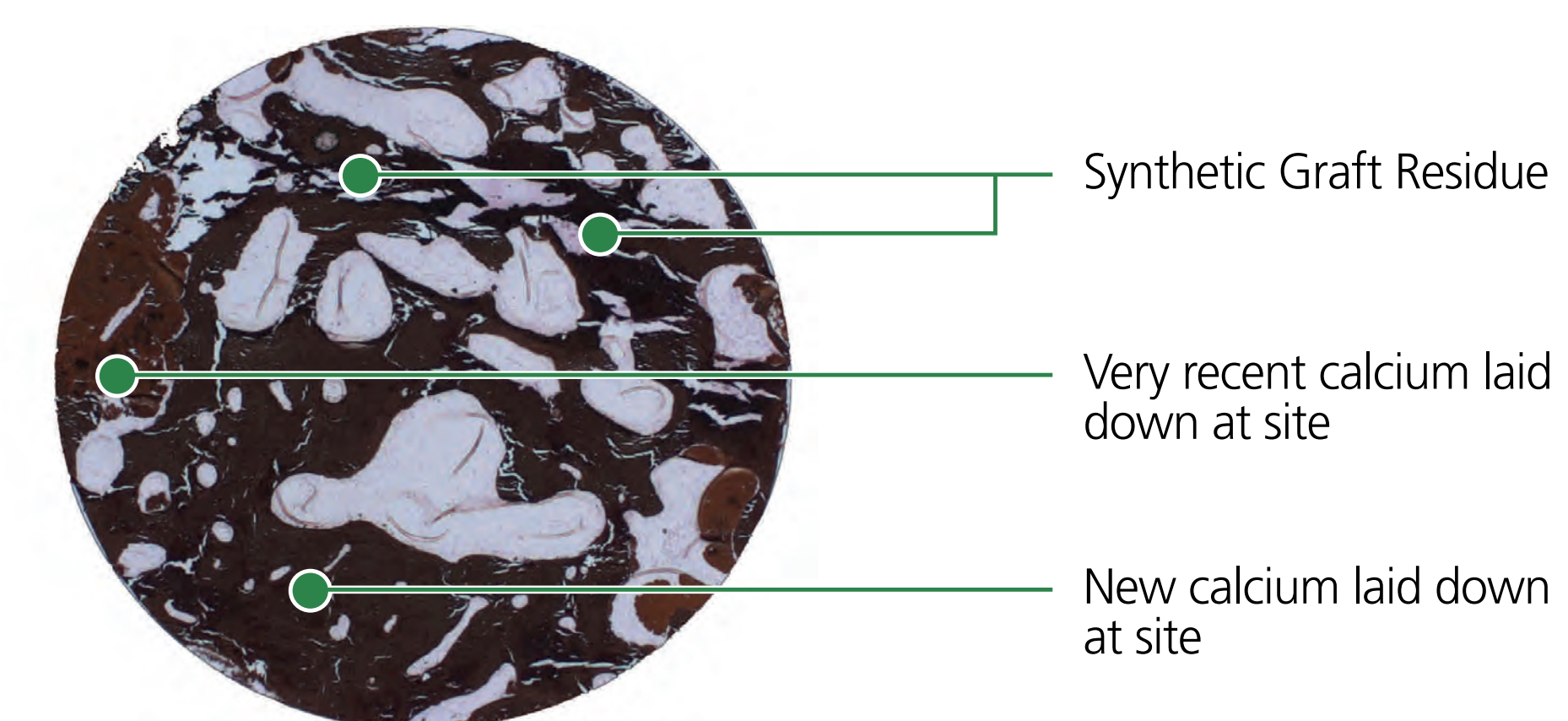


Figure 3. Synthetic Composite site, Core section. Von Kossa Staining (Calcium staining)

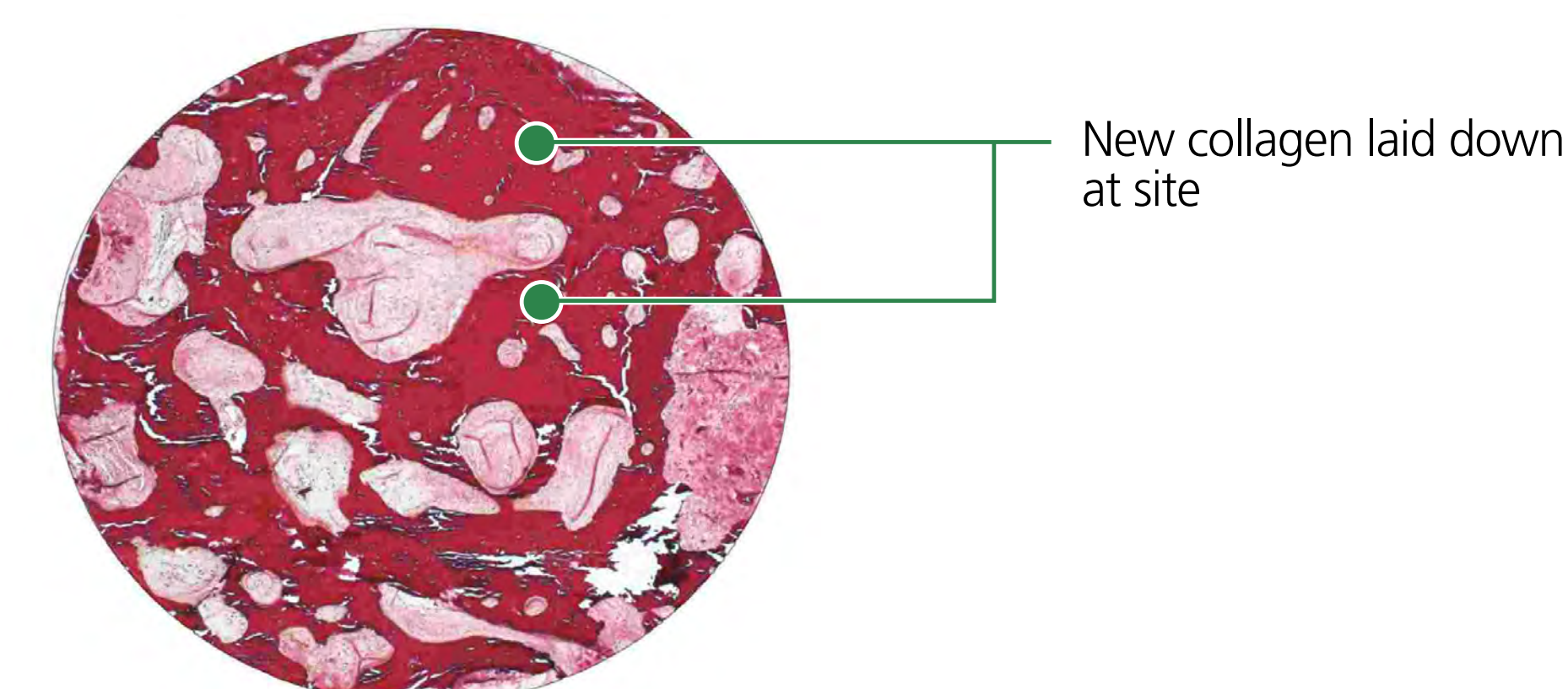


Figure 4. Synthetic composite site, Core section. Van Gieson Staining (Collagen staining)

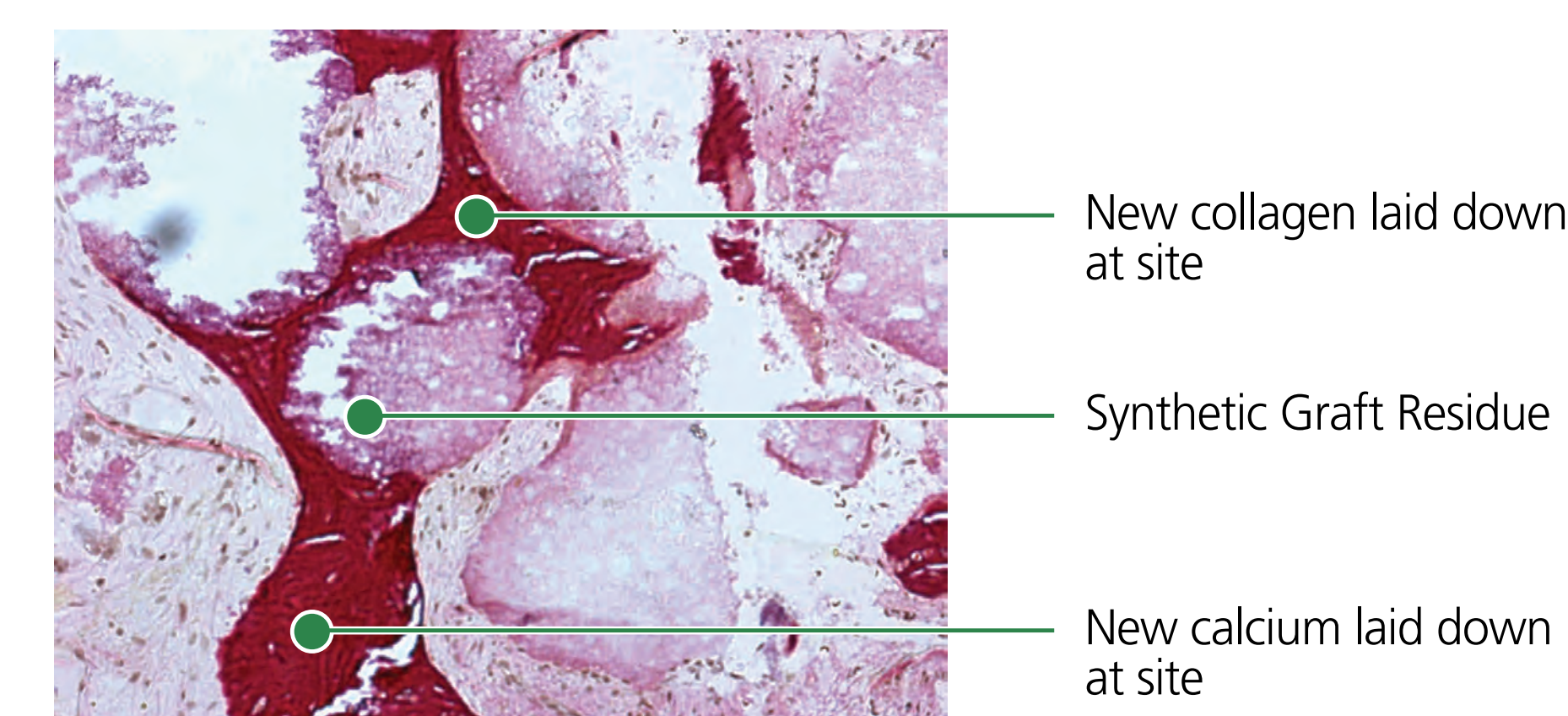


Figure 5. Synthetic Composite site, Core section. X10 Magnification, Van Gieson Staining (Collagen staining)

## Human Bone Graft Site

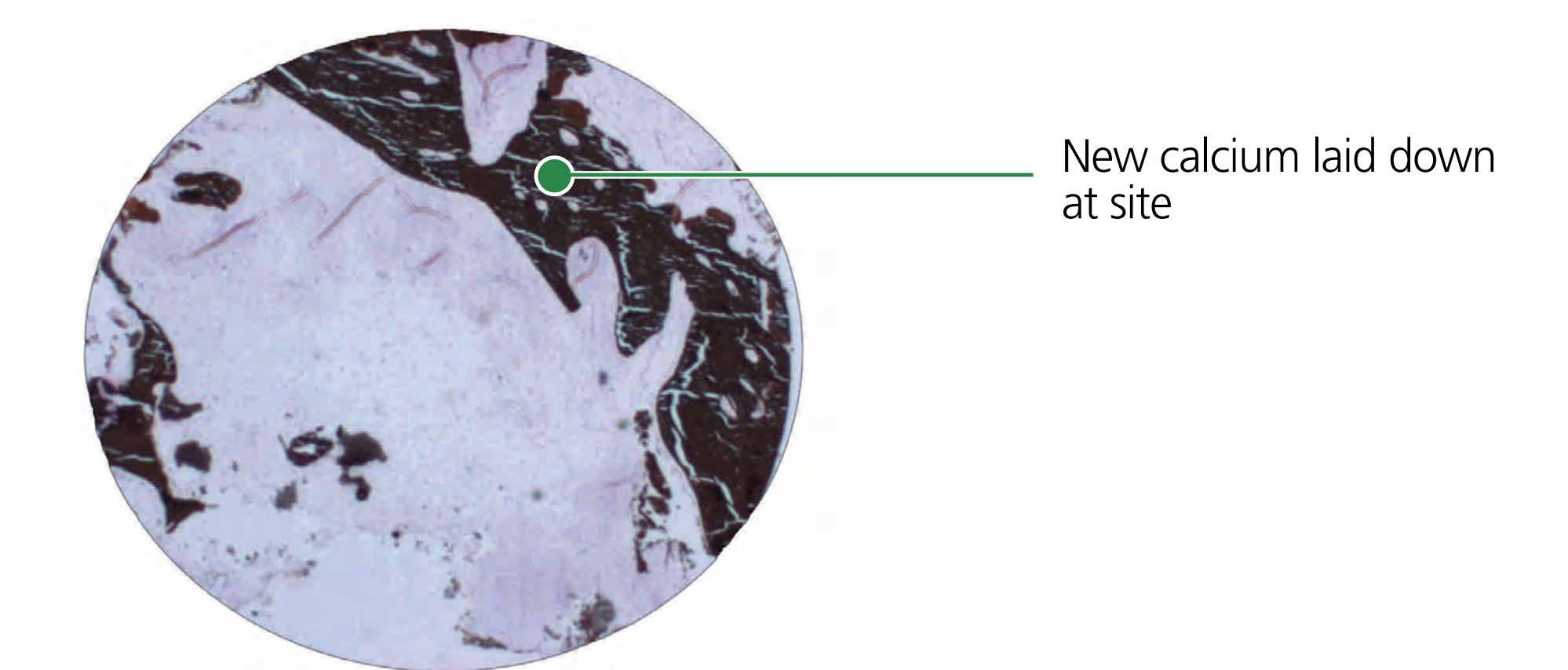


Figure 6. Cancellous graft site, Core section. Von Kossa Staining (Calcium staining)

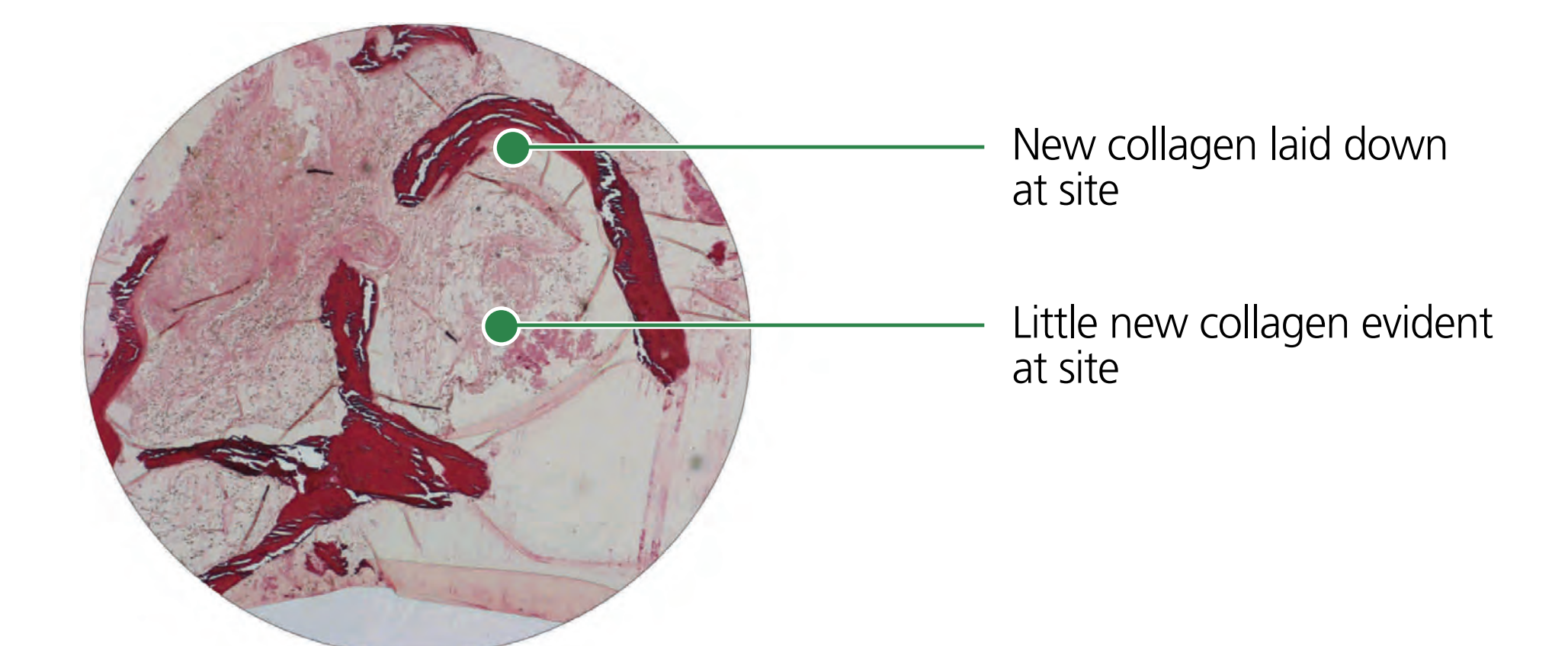


Figure 7. Cancellous graft site, Core section. Van Gieson Staining (Collagen staining)