Scanning Electron Microscopy View of In Vitro Intraneural Injections

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Scanning electron microscopy (SEM) technique allows identification of features from anatomical structures that are traversed by the tip of the needle during an accidental dural puncture [1–3]. Lesions to axons enclosed in injured fascicles may occur in conjunction with damage to blood vessels within the intrafascicular tissue [4]. As a result of blood vessel tissue repair and hematoma reabsorption, variable degrees of fibrosis may affect areas in the proximity of axons. The study of distortions in "used" needle tips, lesions caused to nerve fascicles, and the diameters of blood vessels may aid in the understanding of the mechanisms leading to tissue damage and repair after accidental dural puncture (Figs. 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9, 16.10, 16.11, 16.12, 16.13, 16.14, 16.15, 16.16 and 16.17).

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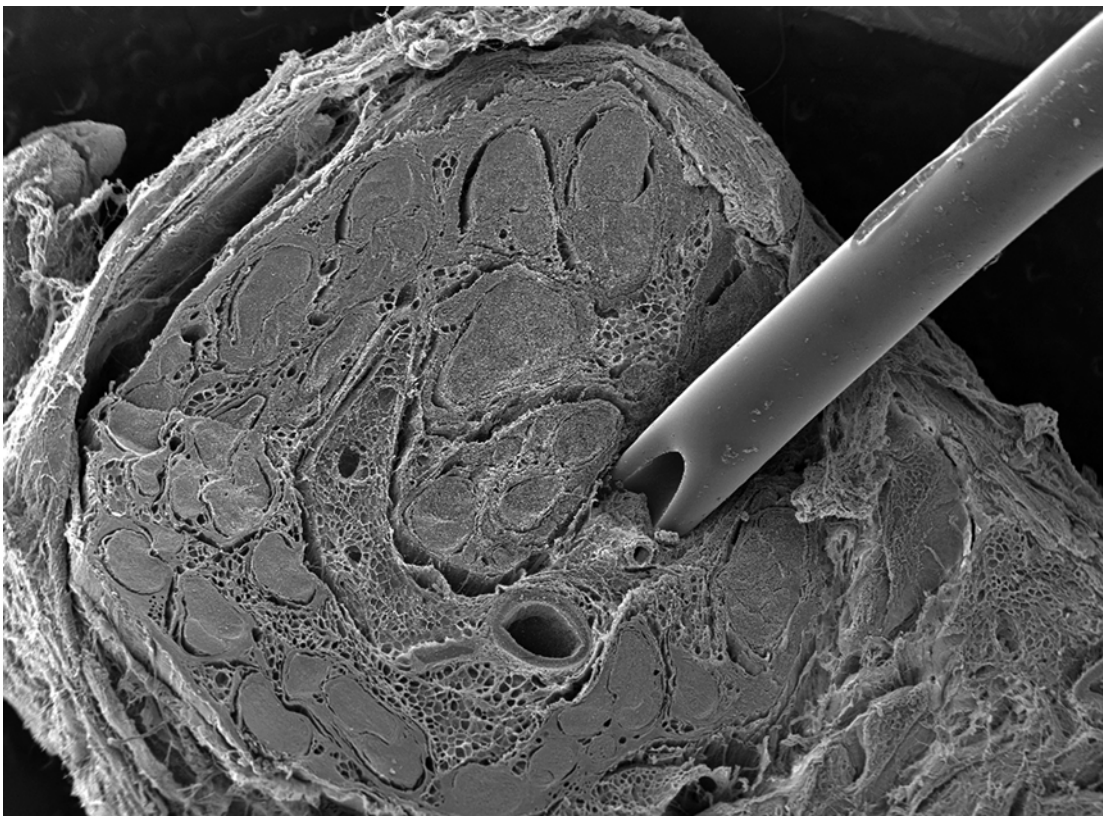

Fig. 16.1 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Comparative view. Scanning electron microscopy. Magnification ×15

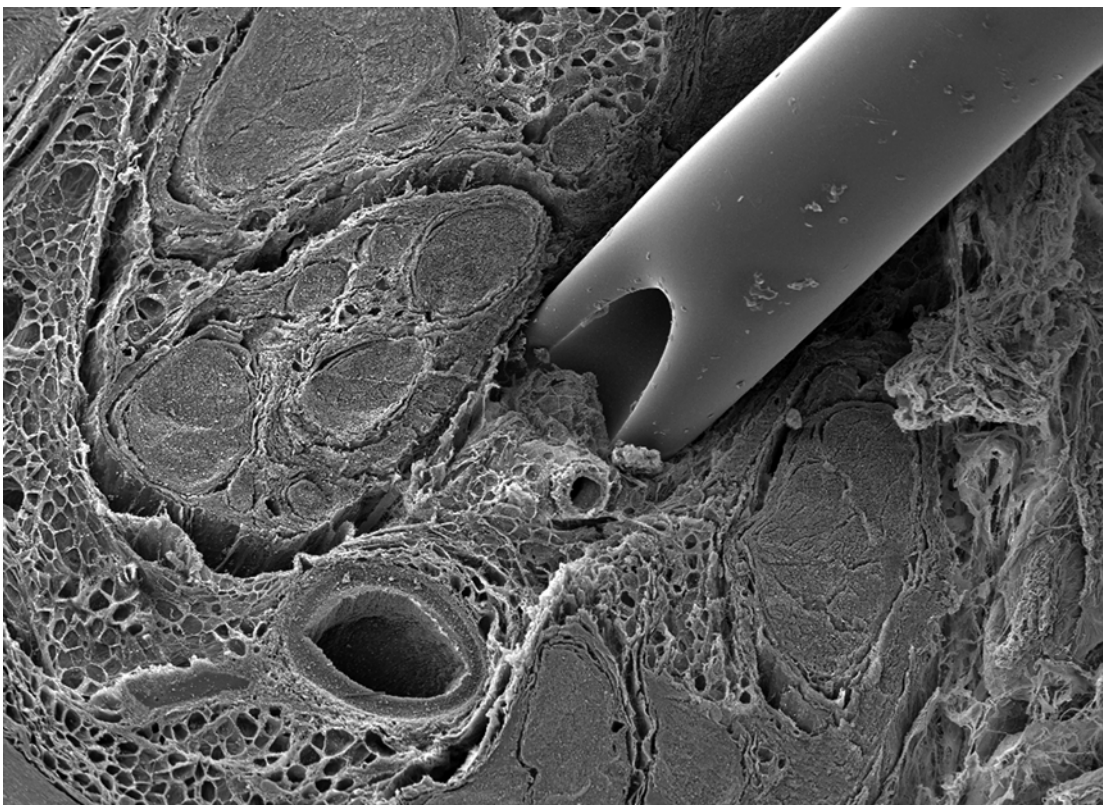

Fig. 16.2 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Detail at higher magnification of Fig. 16.1. Scanning electron microscopy. Magnification ×30

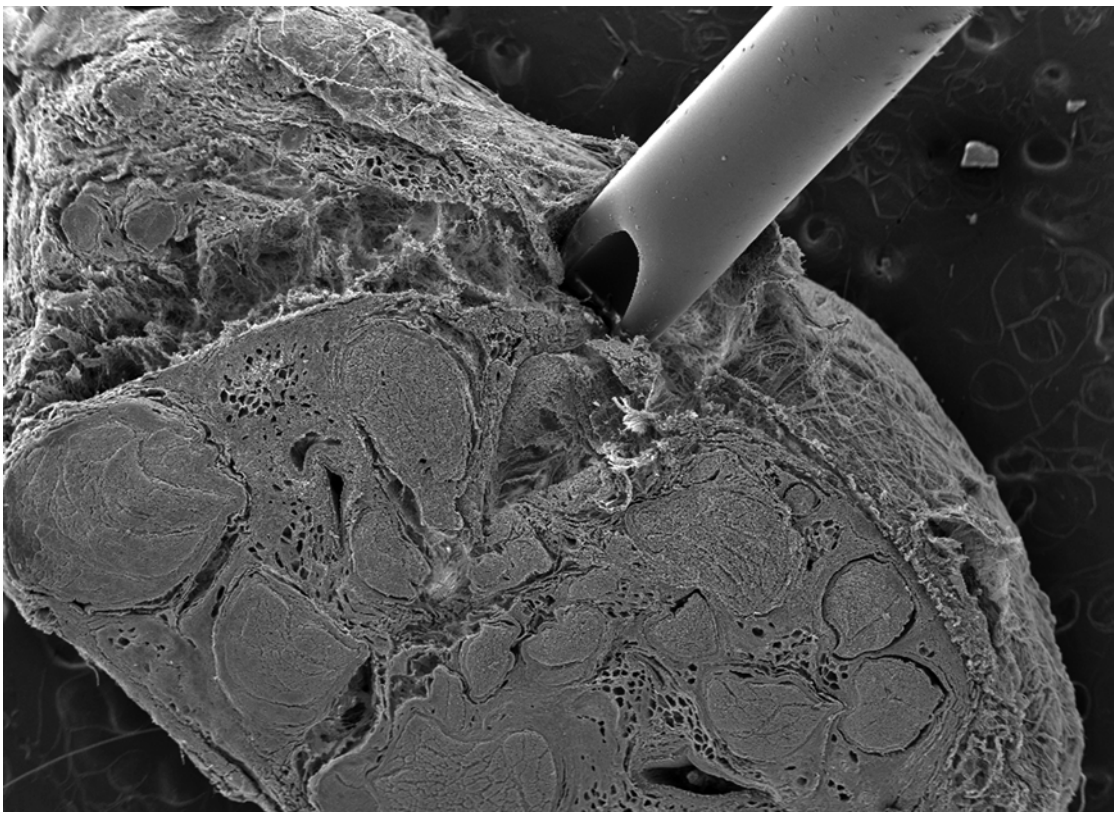

Fig. 16.3 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Comparative view. Scanning electron microscopy. Magnification ×20

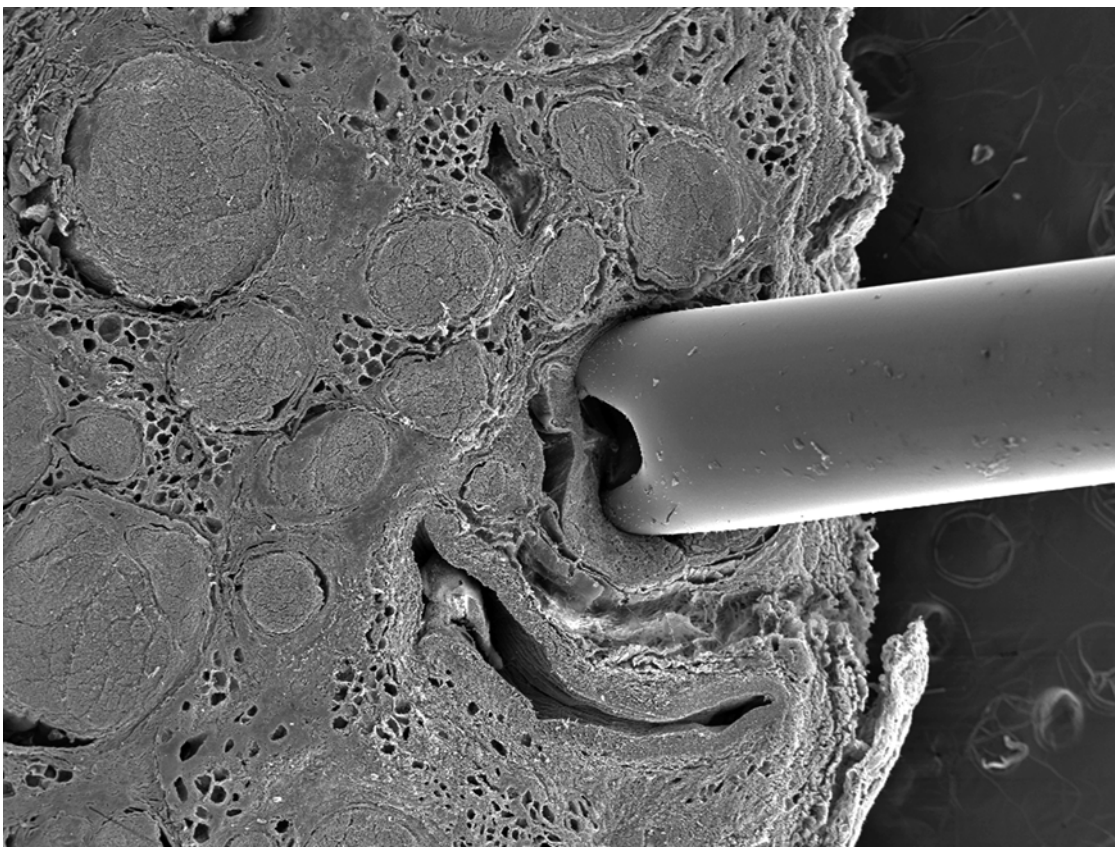

Fig. 16.4 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Fascicles can be identified. Scanning electron microscopy. Magnification ×30

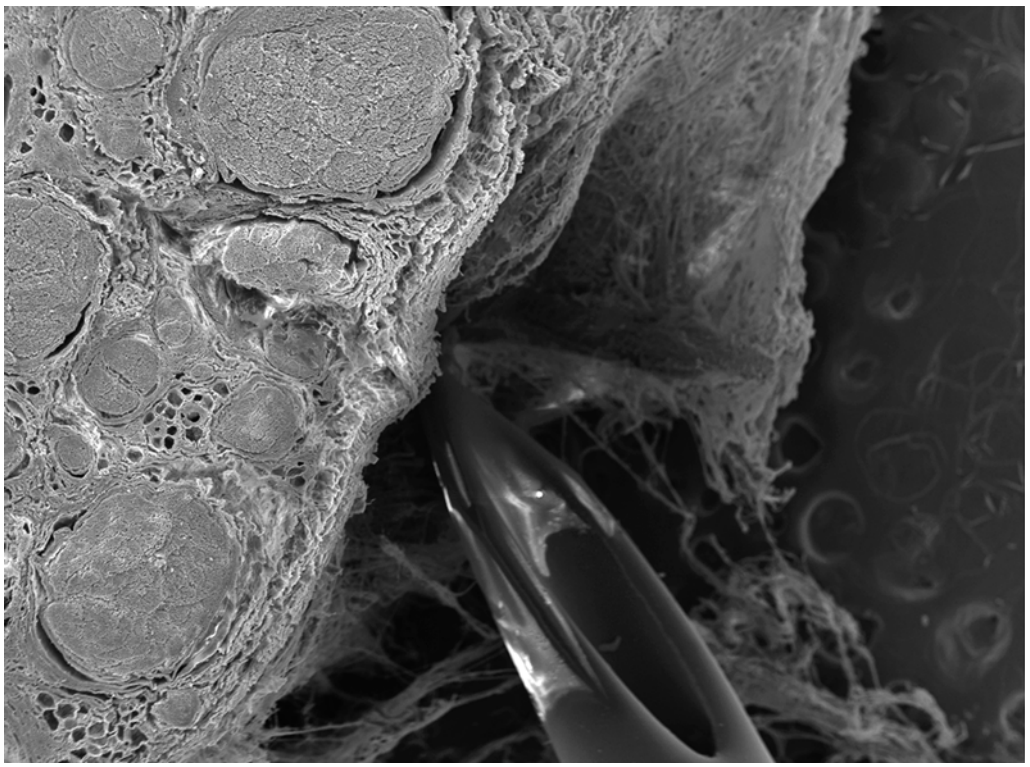

Fig. 16.5 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Tip of the needle in contact with the external surface of the nerve. Scanning electron microscopy. Magnification ×30

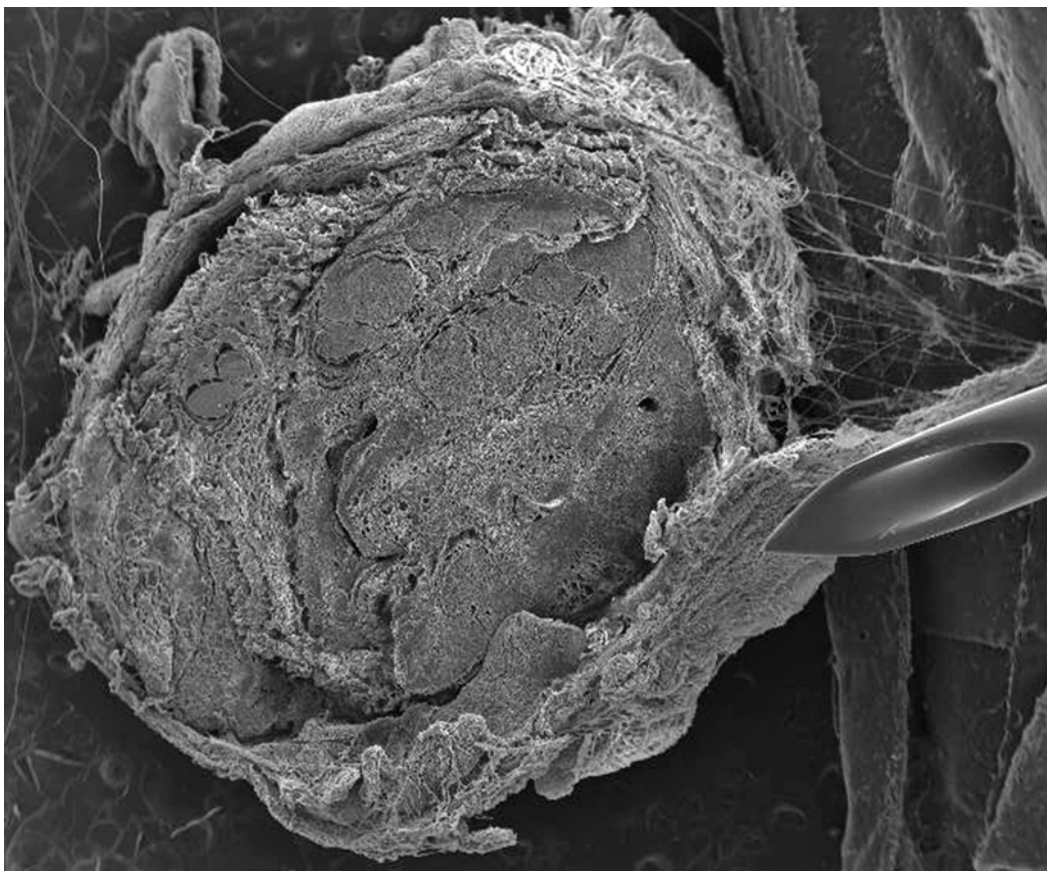

Fig. 16.6 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Comparative view. Scanning electron microscopy. Magnification ×10

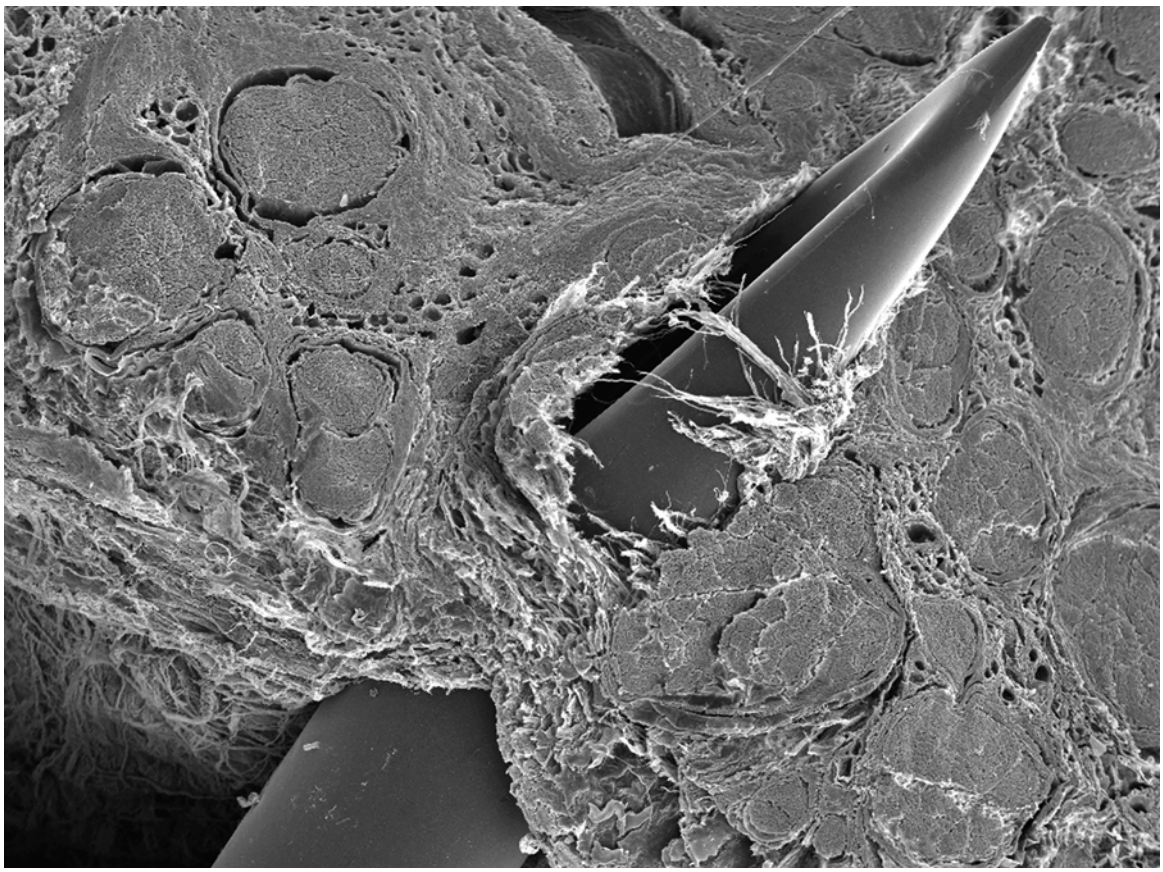

Fig. 16.7 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Needle traversing the fascicles. Scanning electron microscopy. Magnification ×35 (From De Andrés et al. [1], with permission)

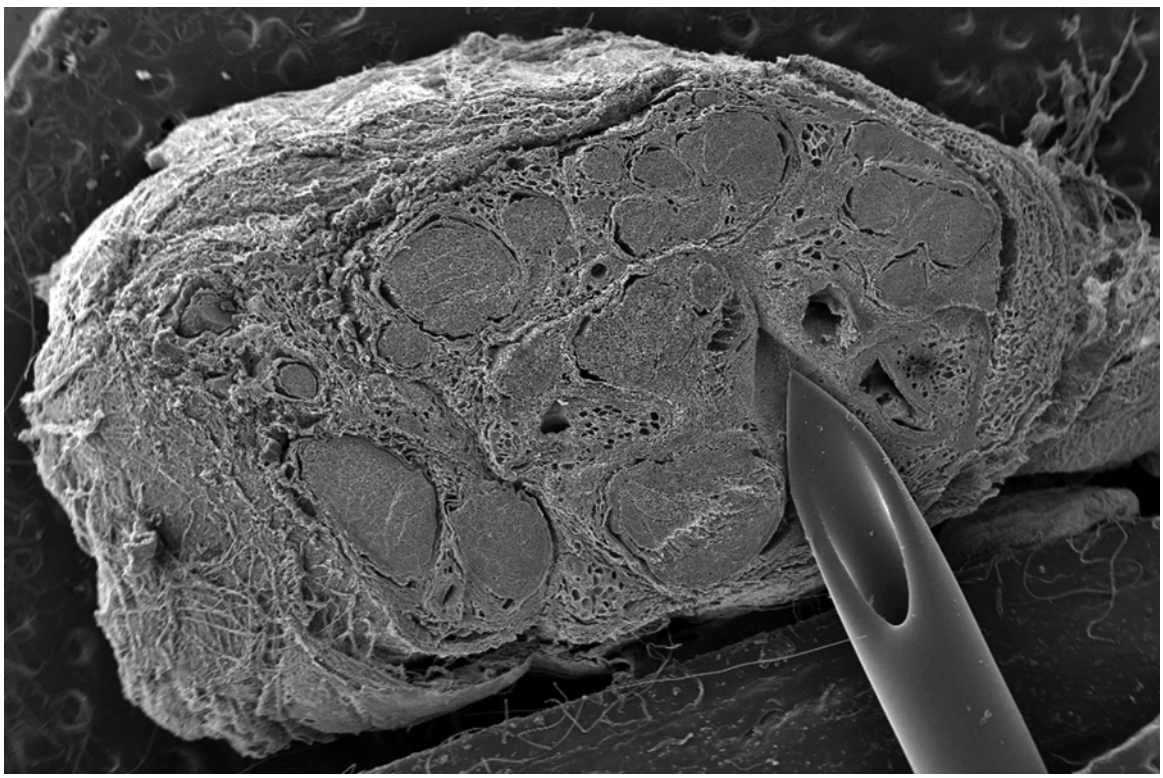

Fig. 16.8 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. View illustrates comparative sizes. Scanning electron microscopy. Magnification ×15

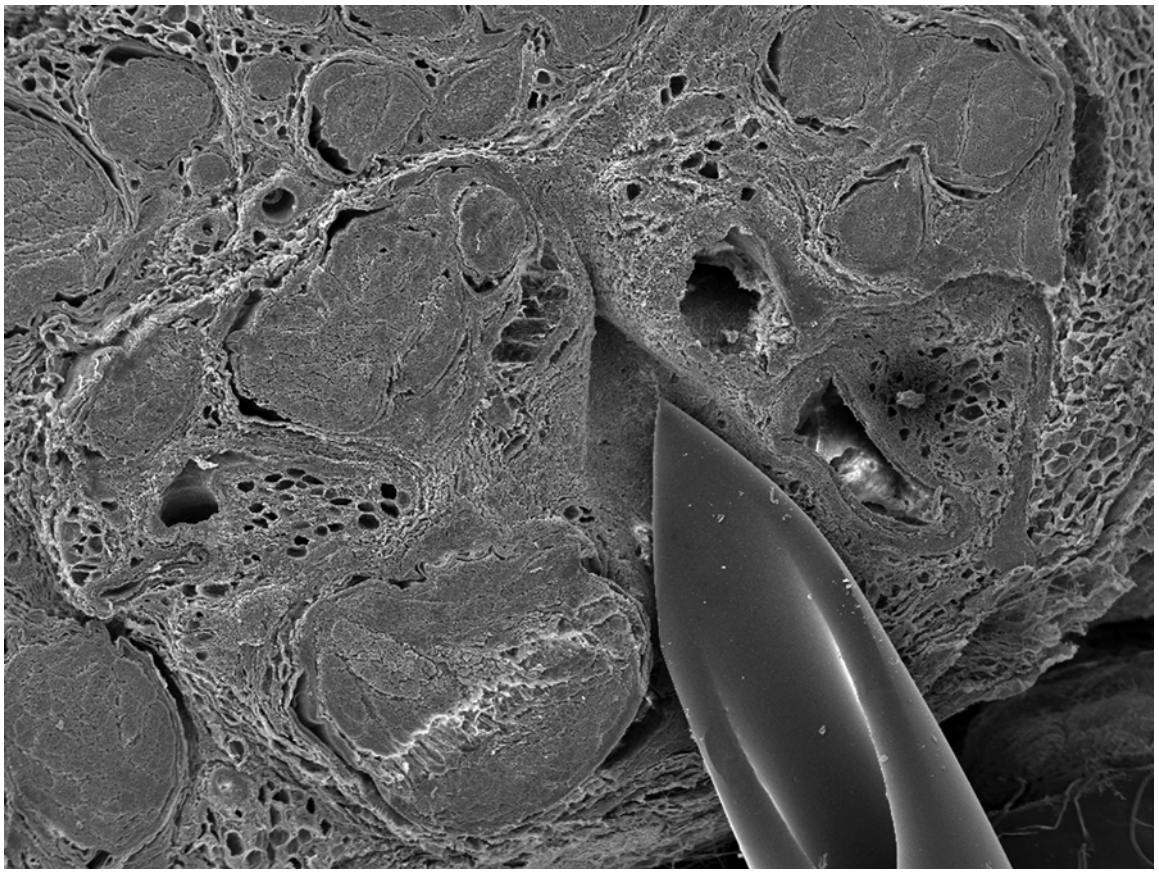

Fig. 16.9 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Detail at higher magnification of Fig. 16.8 Scanning electron microscopy. Magnification ×30

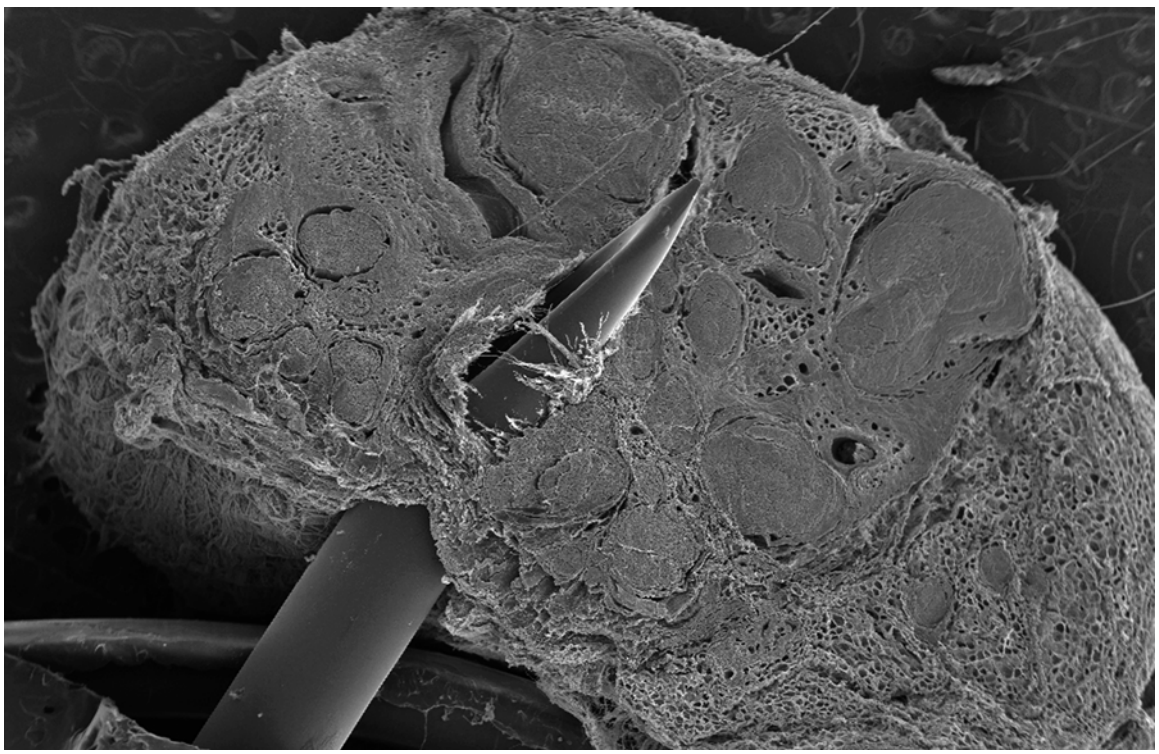

Fig. 16.10 Human sciatic nerve. In vitro puncture of nerve with neurostimulation needle. Needle traversing the fascicles. Scanning electron microscopy. Magnification ×20

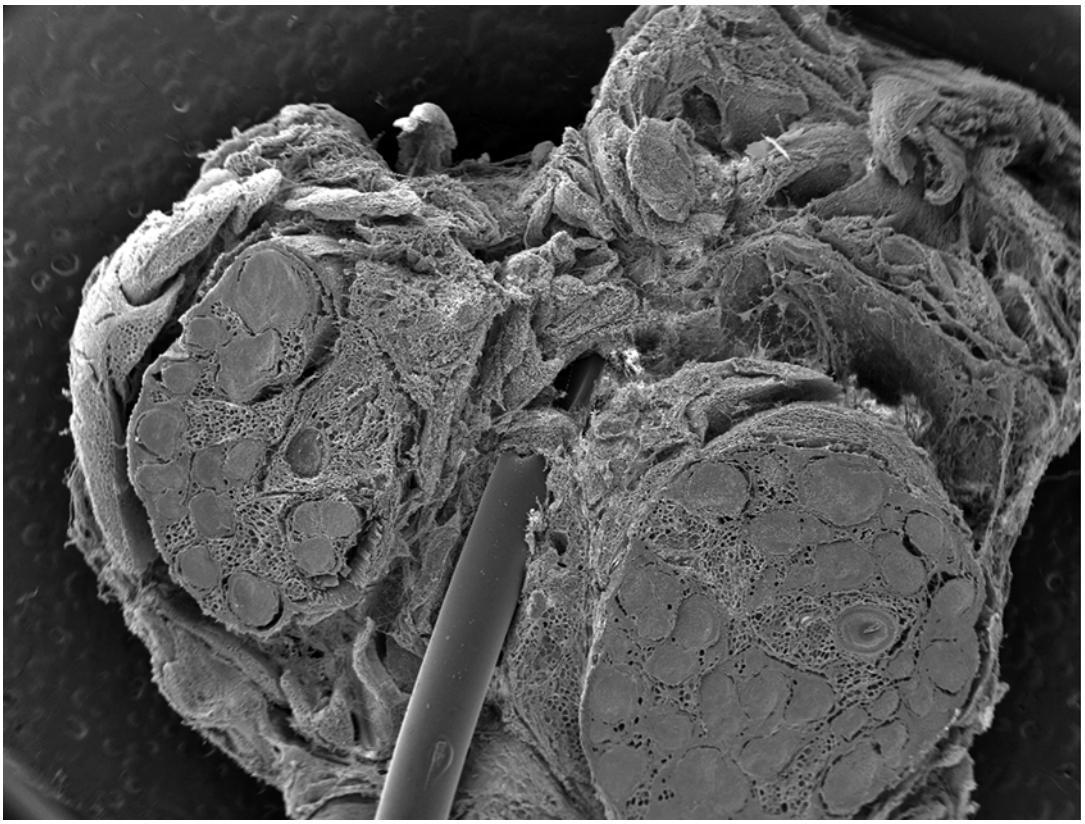

Fig. 16.11 Human sciatic nerve. In vitro puncture of nerve with neurostimulation needle. Needle inserted into the interfascicular fat. Tibial and peroneal components of the sciatic nerve can be identified on the sides of the needle. Scanning electron microscopy. Magnification ×10

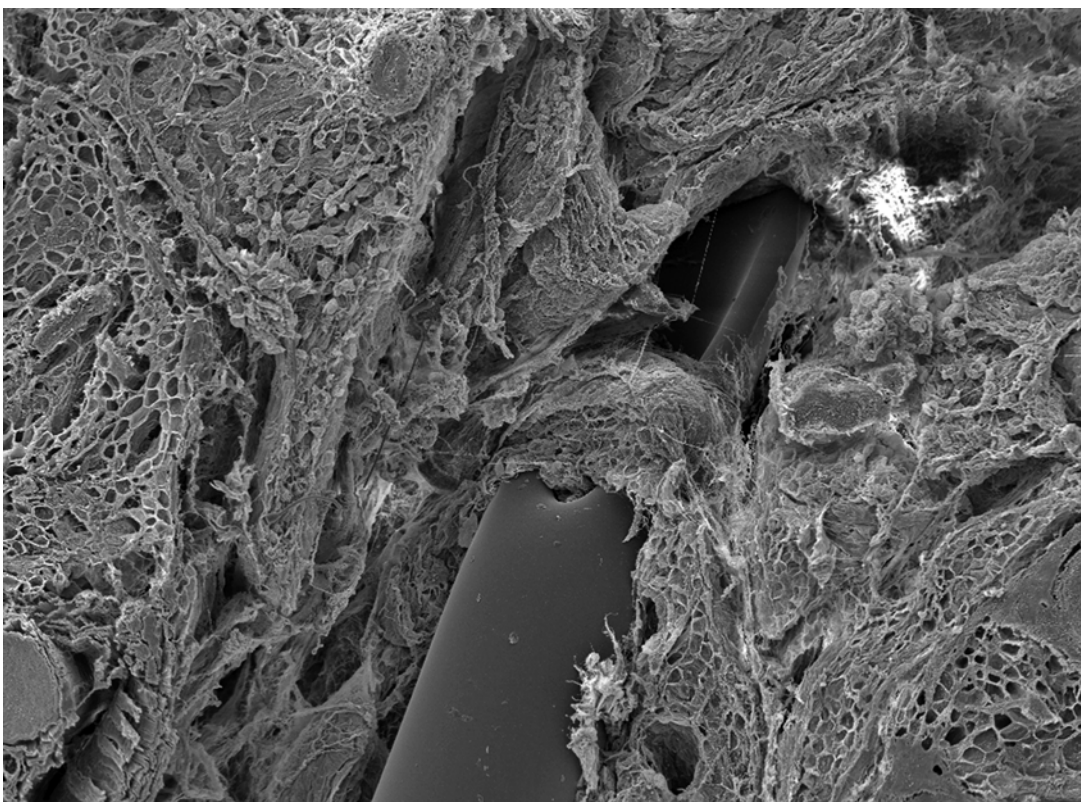

Fig. 16.12 Human sciatic nerve. In vitro puncture of nerve with neurostimulation needle. Detail at higher magnification of Fig. 16.11. Scanning electron microscopy. Magnification ×30

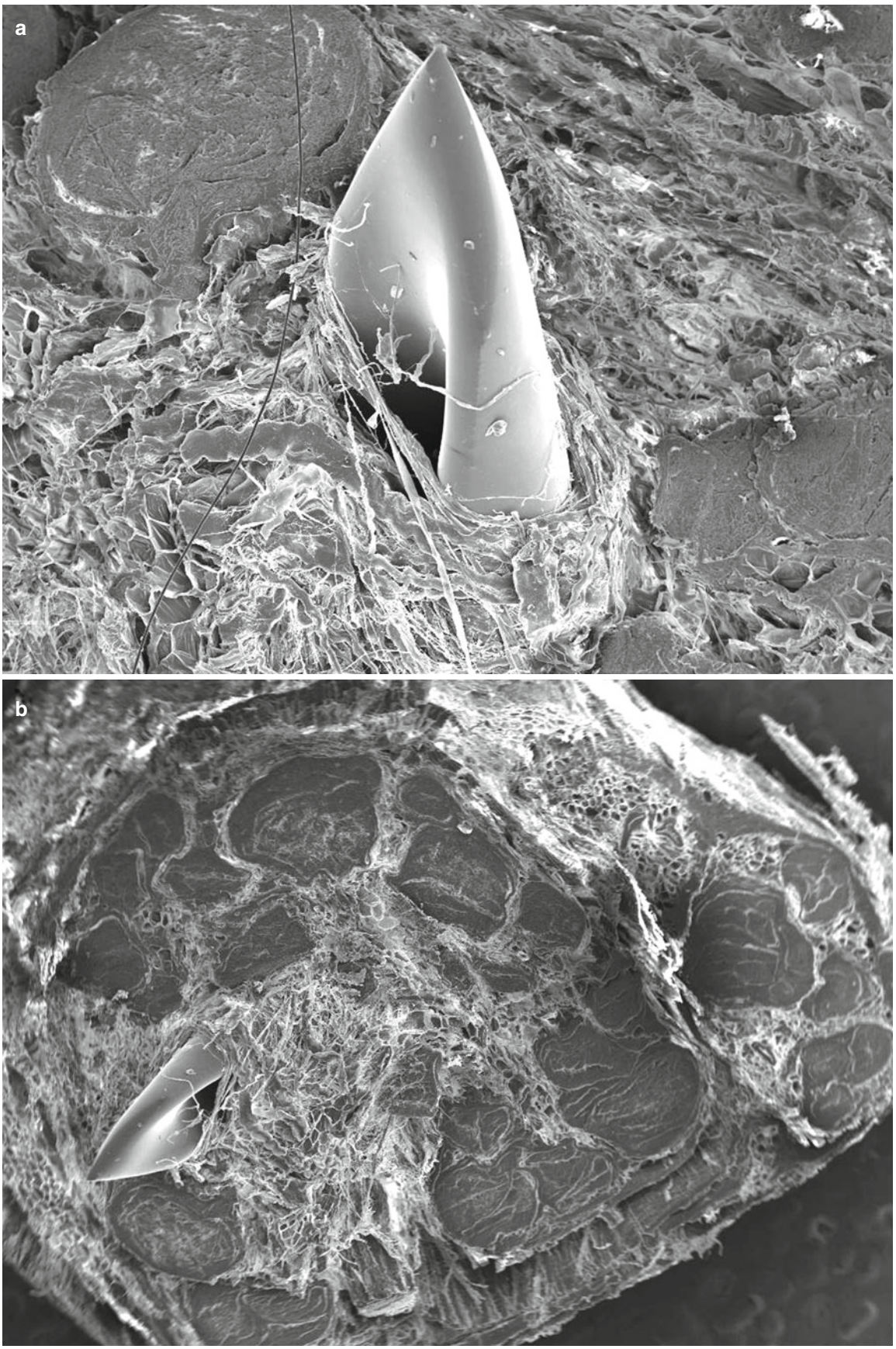

Fig. 16.13 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Needle traversing the fascicles viewed from the exit point. (**a**) Detail at higher magnification of **b**. Scanning electron microscopy. Magnification: **a**, ×50; **b**, ×20

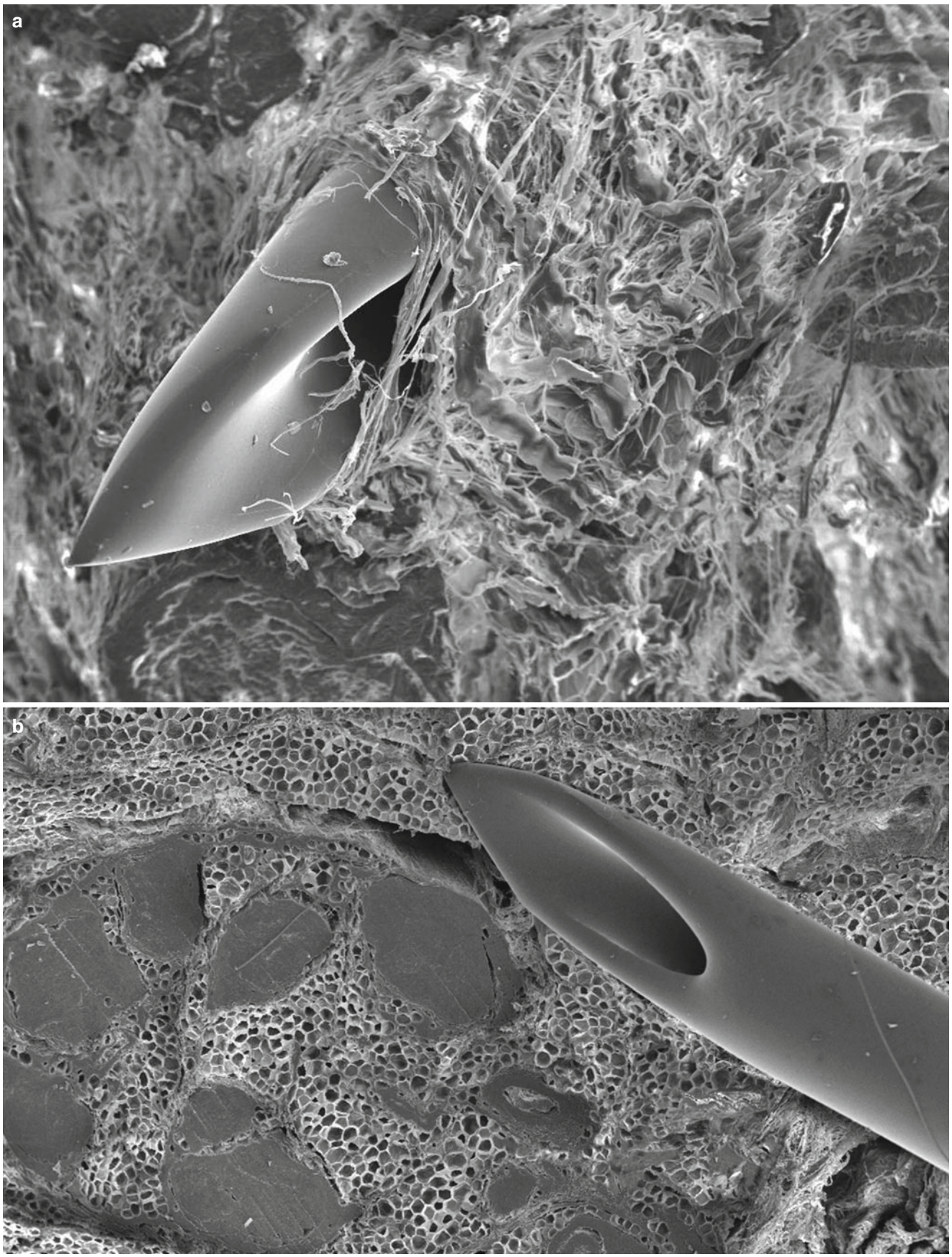

Fig. 16.14 Human tibial nerve. In vitro puncture of nerve with neurostimulation needle. Comparative view. Scanning electron microscopy. Magnification: **a**, ×50; **b,** ×22

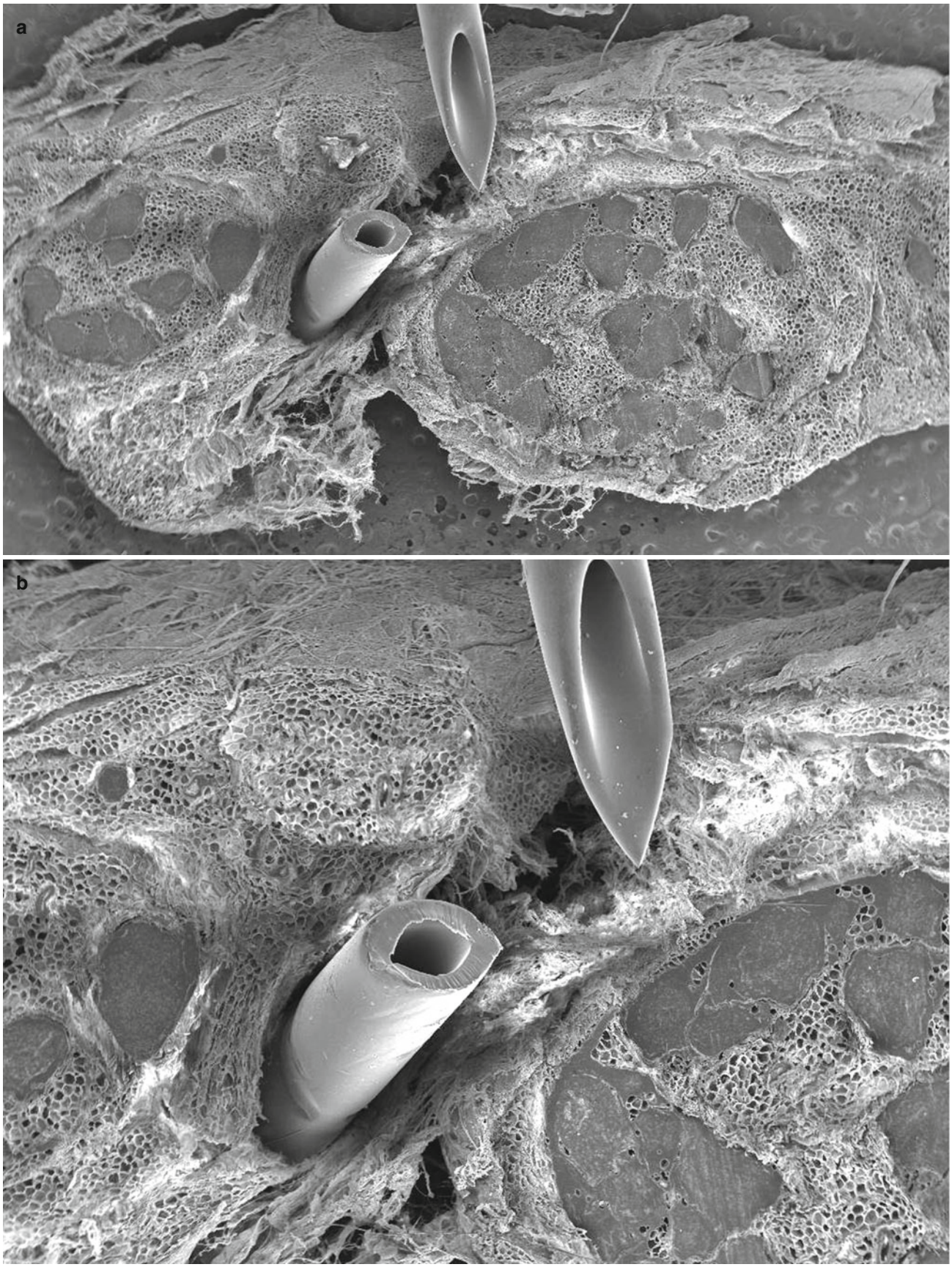

Fig. 16.15 Human sciatic nerve. In vitro intraneural placement of peripheral catheter. Scanning electron microscopy. Magnification: **a**, ×10; **b**, ×20 (Part **b** from De Andrés et al. [1], with permission)

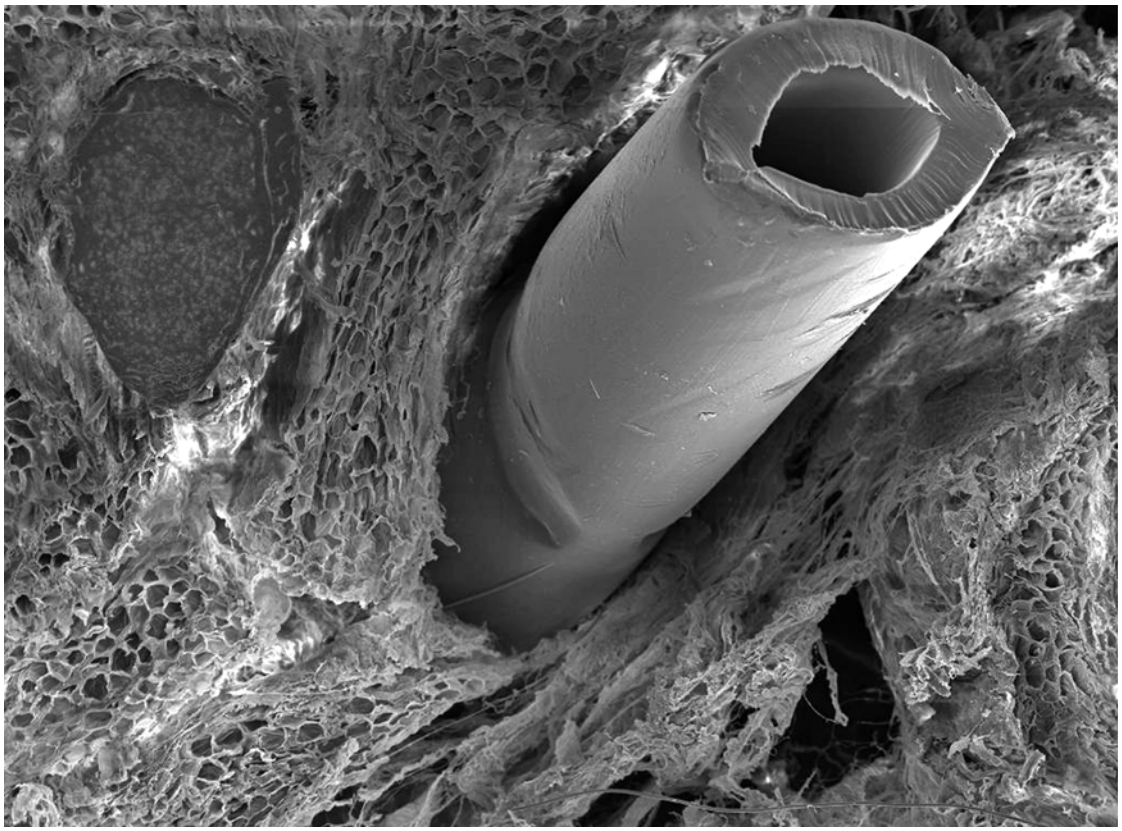

Fig. 16.16 Human sciatic nerve. In vitro intraneural placement of peripheral catheter. Scanning electron microscopy. Magnification ×40

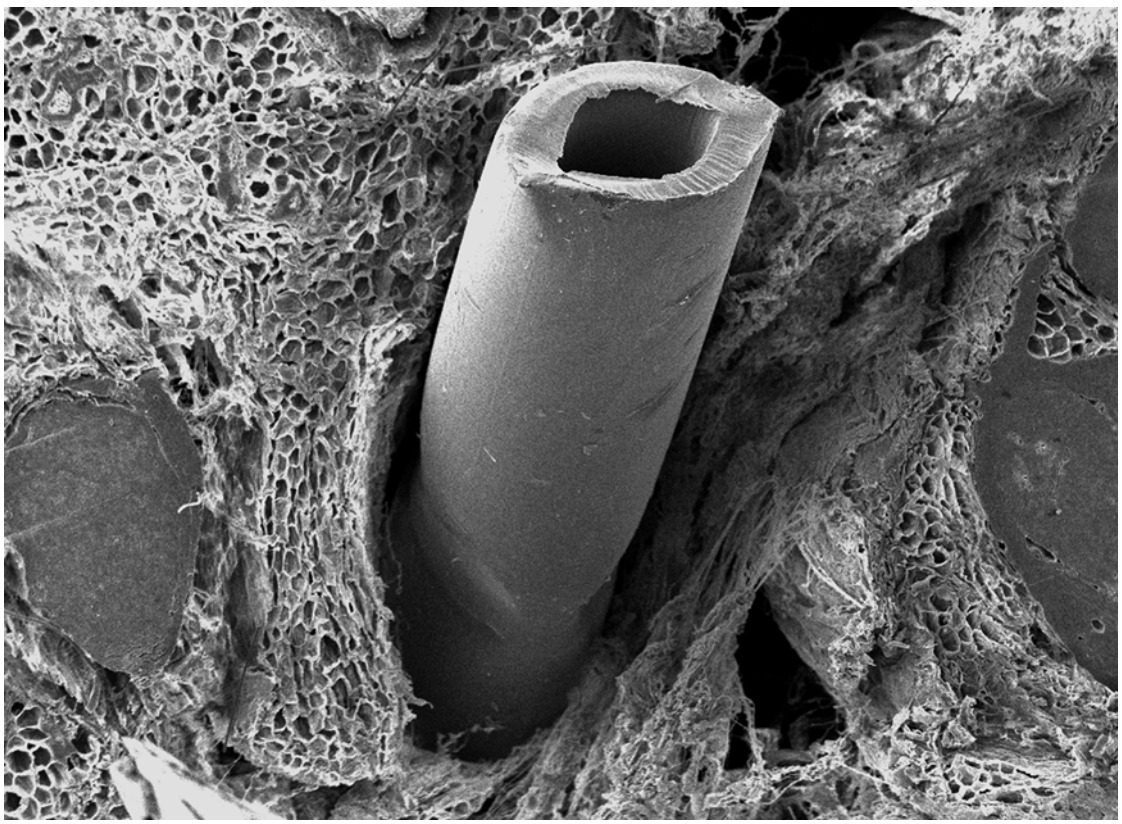

Fig. 16.17 Human sciatic nerve. In vitro intraneural placement of peripheral catheter. Scanning electron microscopy. Magnification ×35

References

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