6.2 Development of a minimally invasive spinal cord interface utilising thin film electronics

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Implantable bioelectronic devices for diagnosing and treating disease are emerging as a prominent component of modern healthcare. However, there remains a technical and clinical barrier within the development of new tools to interface with the central nervous system. Overcoming these barriers could improve the lives of people suffering from conditions such as Parkinson’s, chronic pain and paralysis.

The risk and cost of the surgery associated with device implantations concerning the central nervous system remains a limiting factor. So much so that patients are restricted from potentially life changing treatment due to high levels of surgical risk. Furthermore, potential avenues of research into treatment are limited due to the inherent risk of translation.

We present a flexible, shape adaptive implant which can be used to interface with the spinal cord. The device is fabricated from biocompatible materials and can be used to stimulate and sense the posterior tracks of the spinal cord. The technology is fabricated using scalable manufacturing techniques in order to create a conformable interface which is 100-200 times thinner than commercially available spinal cord stimulators. We demonstrate in a human cadaveric model that the device can be implanted with a minimally invasive procedure, without the need for laminectomy in contrast to the current surgical practice required for commercially available technologies. The device has potential to be applied in the areas of pain management, Parkinson’s disease and rehabilitation and builds upon our understanding of the translation of implantable bioelectronic devices.