In preparation for extending implantable FES technology for limb movement to children, we have examined two methods for enabling leads of fixed length to accommodate limb lengthening associated with growth.

Fourteen electrodes were implanted in fore limbs of three young dogs. The electrode leads, composed of helically wound wired encased in silicone rubber tubing, were tunneled subcutaneously to the shoulder and anchored to bone. Approximately 10 cm of “excess” lead was placed in the subcutaneous space of the upper portion of the forelimb. For eight leads, this excess lead was placed in a pouch formed from expanded polytetra-fluoroethylene surgical membrane. The shape of the reserve lead was monitored by periodic radiographs. The devices were examined surgically after full growth approximately six months later.

Straightening of the excess lead was evident in all six of the leads where the excess was left unprotected in the subcutaneous space. Reserve lead contained in pouches showed clear extension in only two cases and minimal extension in the remaining six. At explant, the pouches were found to contain small amounts of fibrous tissue and sticky serous fluid residue which provided significant resistance to lead extraction.

These results suggest leaving excess lead material unprotected in the subcutaneous space may be preferable to pouch enclosure for the application of implantable FES systems in growing extremities.