The development of electrolysis for local destruction of solid tumours

By:
Guy John Maddern

Department of Surgery
The Queen Elizabeth Hospital
The University of Adelaide
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G.J. Maddern

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Abstract

This thesis comprises the collection of publications on the development of electrolysis as a local ablative technique for solid tumours including the liver and pancreas.

This work has been conducted in association with a number of colleagues included as authors on the papers submitted. The research efforts have been under my coordination and direction, with all patient studies exclusively managed by myself. The work presented first establishes the feasibility of electrolytically produced lesions in small and large animal models, and then its effect on tumour cells in a small animal model.

Unfortunately no suitable large animal tumour model exists so dose response calculation was determined in a pig liver that approximates human dimensions and anatomy. Studies were also conducted to better understand the mechanism of the destructive effects of electrolytic treatments. The pH changes not heat production were found to be the primary mechanism of cell death. When applied to patients in both a pilot and limited clinical study for liver tumours, complete destruction of tumour can be achieved without any adverse effects being detected.

The electrolytic destruction has also been applied to pancreatic tissue with similar controllable effects which may offer a palliative option for pancreatic cancer in the future.