

Effects of the radiofrequency interference with modified titanium surgical clips on liver parenchyma – an in vivo experiment

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Abstract

Aim: This study sets out to test the biocompatibility of titanium clips in liver, in the presence of radiofrequency. Biocompatibility is assessed at various distances from the RF electrode and different points in time.

Method: It is an experimental study conducted on pigs and makes use of histological changes that occur at the liver - titanium interface in presence of RF to test hypotheses. The titanium clips were modified in high vacuum (10⁻⁵ atm) by heating them at 1000 °C and 1150 °C. Titanium clips were placed in liver at 0.5, 1.5 and 2.5 cm from RF probe. At 7, 14 and 28 days the inflammation, necrosis and fibrosis were assessed.

Results: The histological alterations decrease with the distance of implantation of titanium clips. The inflammation and necrosis nearby the titanium clips decrease in time, but the fibrosis does not increase, as expected. The modified titanium at 1000°C clips cause less necrosis than commercial titanium clips. The moderator role of clip type between distance and cell alteration is empirically supported only for fibrosis and necrosis. The moderator role between time and cell alteration is supported only for inflammation.

Conclusions: Experimental data suggests there are no preferred surgical clips in all situations. The biocompatibility of the titanium clips depends on the distance from the RF probe. The commercial ones prove less damaging if they are placed close to the RF probe (less than 1 cm) and those that were treated at 1150 C have a better bio-compatibility if placed more than 1 cm from RF probe.

Key words: Thermal modified titanium clips, radiofrequency, inflammation, necrosis, fibrosis

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