On the Use of Electro-Magnetic Tracking Systems for Catheter Tracking in Image Guided Surgery

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Recent advances in minimally invasive surgery treating cardiovascular diseases are increasingly leading to the use of interventional radiology to replace conventional open surgery. The insertion of a catheter through the femoral artery allows the interventionalist to, for example: position an endovascular stent graft (in order to shunt an aortic abdominal aneurysm); position an aortic valve replacement, to position an endoclamp balloon (as part of another procedure); percutaneously ablate cardiac tissues using a special radiofrequency catheter probe (in order to treat atrial fibrillation). In any case, the precise positioning of the device to be delivered is crucial [1].

Electro-Magnetic Tracking Systems (EMTS) are used to track the positions and orientations of a set of small coils in a magnetic field, with sub-millimetric accuracy [2]. These systems do not require line-of-sight and could therefore be used to track catheters within the human body, by mounting a coil on the tip of a catheter.

In this work we describe a rapid assessment protocol for EMTS, and measure the accuracy of a specific commercial system, the Aurora® (NDI, Waterloo, Ontario, Canada). We concede that EMTS can be used to drive surgical navigation system, but that care must be given in setting it up, and its use in proximity of electromagnetic disturbances such as metals present in surgical tools, angiographic C-arm and other devices. To this end, we list a DO’s and DON’Ts in EMTS in surgery.

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