

Minimizing the Risk of a Retained Surgical Needle with a Fluorescent Coating Visible with Standard Black Light

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Introduction:

Surgically retained foreign bodies (RFB) have significant clinical, financial and legal consequences. Lost smaller items such as needles are particularly challenging. We evaluated the utility of coating needles with a thin layer of polymer film impregnated with either fluorescent quantum dots (QD) or dyes excited with black light to minimize the time required to locate a needle and reduce the risk of a RFB.

Methods:

11mm long surgical needles coated with cyanoacrylate polymer containing either fluorescent QD (n=16) or dyes (n=16) were hidden at random sites within the abdominal cavity of New Zealand rabbits after a standard laparotomy. The surgeon was blinded to needle location and timed in finding control needles (n=16) with standard lighting and fluorescent needles with a 12w black light. The surgeon had up to 5 minutes to find the needle; if a control was not found, the surgeon searched for the same needle with black light excitation.

Results:

100% of fluorescent QD and dye infused polymer needles were located in significantly less time, average 52 and 38 seconds respectively, compared to control needles, 83 seconds (p<.05). Only 75% of the control needles were located within 5 minutes, and all 4 unfound control needles were identified with fluorescence within an average of 84s.

Discussion:

The thin, non-toxic polymer coating of QDs or fluorescent dye allowed for a significant reduction in the time required for real time needle localization. This technology has the potential to minimize the risk of RFB by allowing rapid detection of misplaced needles.

Needle Type	Percent Located Within 300 s	Average Time (s)	Avg. Time to Find with Fluorescence (s)	Significance (p value)
Control (n=16)	75	145	83 (30,30,230,45)	
Fluorescent QD (n=16)	100	53	n/a	0.0119
Fluorescent Dye (n=16)	100	38	n/a	0.0014