Delayed Scalp Erosion After DBS Surgery: Incidence, Treatment, Outcomes and Prevention

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Introduction

Deep brain stimulation (DBS) is an established therapeutic modality for movement disorders, however, complications related to the surgical technique and the implanted hardware do occur and must be minimized to optimize outcomes. Delayed erosion of the scalp overlying protruding DBS hardware is one such adverse event that universally requires surgical treatment and often necessitates explantation of the DBS system. In this study, we evaluated the incidence of delayed scalp erosion in a large single center series of DBS patients, and we propose a surgical strategy for avoiding this complication. We have modified our surgical technique to eliminate protrusion of DBS hardware, effectively preventing delayed erosions. This technique consists of drilling a recess around the burr hole to countersink the DBS cap, and drilling a groove in the parietal calvarium to countersink the connector.

Methods

We performed a retrospective review of 1053 consecutive DBS lead implantations and 867 lead extension cable placements at a single center (UF) by a single surgeon (KDF) from 2002 to 2014. Patients were separated into countersunk and non-countersunk groups based on the surgical technique applied at the time of implantation. We routinely began countersinking the frontal cap in 2011 and the connector in 2013. Each patient had a follow-up time of at least 12 months.

Demographics

	Number	Mean Age (SD) in years	Mean Disease Duration (SD) in years	% Male	Mean BMI (SD)
DIAGNOSIS					
Parkinson's Disease	372 (57.9%)	61.5 (9.1)	11.5 (5.2)	72%	26.4 (5.1)
Essential Tremor	144 (22.4%)	70.6 (12.3)	25.7 (17.7)	61%	28.9 (6.0)
Dystonia	78 (12.1%)	39.7 (21.2)	13.7 (12.9)	58%	23.1 (5.2)
Multiple Sclerosis	14 (2.2%)	45.8 (12.7)	9.9 (7.4)	29%	24.3 (7.2)
Obsessive Compulsive Disorder	11 (1.7%)	41.2 (13.7)	26.4 (15.7)	45%	26.8 (6.2)
Traumatic Tremor	8 (1.2%)	44.0 (19.0)	8.9 (5.3)	50%	28.9 (5.1)
Tourette	6 (0.9%)	30 (6.1)	22 (7.2)	33%	27.1 (7.6)
Alzheimer's Disease	5 (0.8%)	62.2 (6.6)	5.3 (5.7)	40%	32.1 (6.5)
Cluster Headache	1 (0.2%)	52	Unknown	100%	23.4
Huntington's Disease	1 (0.2%)	33	2	100%	24.6
Multiple System Atrophy	1 (0.2%)	54	10	100%	24.2
Thalamic Pain	1 (0.2%)	68	9	100%	24.1
Total	642	59.6 (5.6)	15.1 (12.1)	66%	26.6 (5.6)

Results

No frontal scalp erosions developed at sites where the cap had been countersunk versus 11 erosions (1.4%) in the non countersunk group. One (1.1%) parietal scalp erosion developed at the site where the connector had been countersunk versus 12 erosions (1.5%) in the non countersunk group.

Conclusions

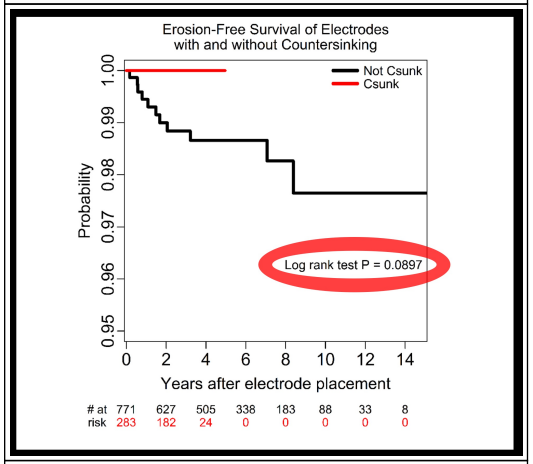
There was a strong trend toward significant reduction in erosion of the frontal DBS cap with the countersinking technique and a weaker trend toward reduction in wound erosion of the lead extension connector with countersinking. Because of the relatively low incidence of erosions in either group, statistical significance is challenging to achieve. However, intuitively, one would presume that lower profile hardware would tend toward less stress on the scalp layers and therefore less chance of erosion. The countersinking technique should be considered as a means to decrease wound erosions and provide patients with more satisfying cosmetic appearances.

Results – Frontal Cap

	Countersink	No Countersink	
Cumulative electrode f/u (yrs)	678 (2.4 mean; 1.1 std)	4299 (5.6 mean; 3.5 std)	
BMI per electrode	27.3 (5.4 std)	26.2 (5.8 std)	*
Age per electrode (yrs)	61.6 (12.8 std)	56.2 (17.5 std)	*
Gender per electrode	63% male	65% male	
Total Electrodes	283	771	1054
Total Patients	212	464	676

* Wilcoxon rank sum p-value significant at the 0.001 level

	Countersink	No Countersink
Erosions	0	11 (1.4%)
Mean time to erosion (yrs)	N/A	2.4 (2.7 std; 0.2-8.4)

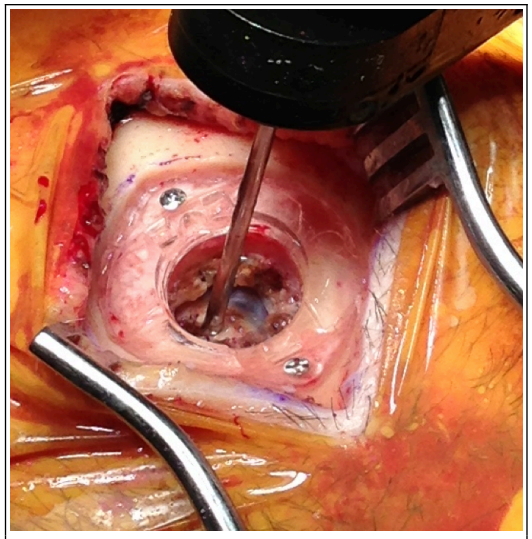


Results – Extension Connector

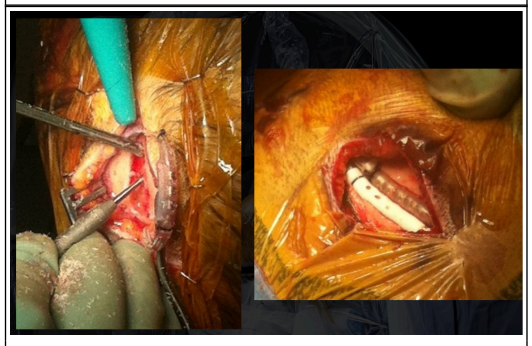
	Countersink	No Countersink	
Cumulative connector f/u (yrs)	144 (1.6 mean; 0.6 std)	4217 (6.9 mean; 3.4 std)	
BMI per connector	26.9 (5.3 std)	26.5 (5.7 std)	
Age per connector (yrs)	62.4 (13.1 std)	58.1 (16.4 std)	*
Gender per connector	48% male	67% male	
Total Connectors	90	778	868
Total Patients	76	582	658

* Wilcoxon rank sum p-value significant at the 0.001 level

	Countersink	No Countersink
Erosions	1 (1.1%)	12 (1.5%)
Mean time to erosion (yrs)	0.4	2.5 (3.4 std; 0.1-9.6)



Example of countersinking the frontal cap.



Example of countersinking the extension connector.