

Prospective Surveillance of Surgical Site Infection after Cranial Neurosurgery: Infection Rate and Risk Factors

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background

- data on Surgical Site Infection (SSI) in neurosurgery of the head is scarce
- incidences of 1–11% are reported¹⁻¹¹
- a prospective surveillance to determine SSI rate and risk factors at our hospital was conducted

methods

- the study was performed during one year (Feb 2013 to Jan 2014) at our tertiary care centre
- data from all patients undergoing cranial neurosurgical procedures were entered prospectively into a database according to the definitions of CDC/NHSN (Craniotomy CRAN, ventricular shunt VSHN)¹²⁻¹³
- index procedures had a follow-up of 30 days without and 1 year with implantation of foreign material, respectively
- all subsequent procedures within the follow-up period were recorded
- exclusion criteria: endonasal access
- recorded clinical/ surgical data: age, gender, BMI, diagnosis and surgical intervention, NNIS-Index, antibiotic prophylaxis, emergency operation, external ventricular drainage (EVD)
- correct antibiotic prophylaxis: within 1 hour prior to surgical incision (or 2 hours if receiving vancomycin or a fluoroquinolone)

results

patients (n=317)

median age (range)	61 (17-91)
female gender	145 (46%)
median BMI* (range)	24.6 (15.6-42.2)

* n=288

¹Buffet-Bataillon PMID21277651 // ²Erman PMID15680644 // ³Edwards PMID20004811 // ⁴Lietard PMID18826362 // ⁵Kasatpibal PMID20865088 // ⁶Korinek PMID16120519 // ⁷Sanchez-Arenas PMID19228465 // ⁸Sanchez-Arenas PMID19228465 // ⁹Korinek PMID9361061 // ¹⁰McClelland PMID1755470 // ¹¹Abu Hamdeh PMID24588653 // ¹²Horan PMID18538699 // ¹³McKibben PMID15877016

index procedures (n=333)

craniotomy (CRAN)	320 (96%)
- trepanation	117 (35%)
- cranioplasty	33 (10%)
shunt (VSHN)	13 (4%)

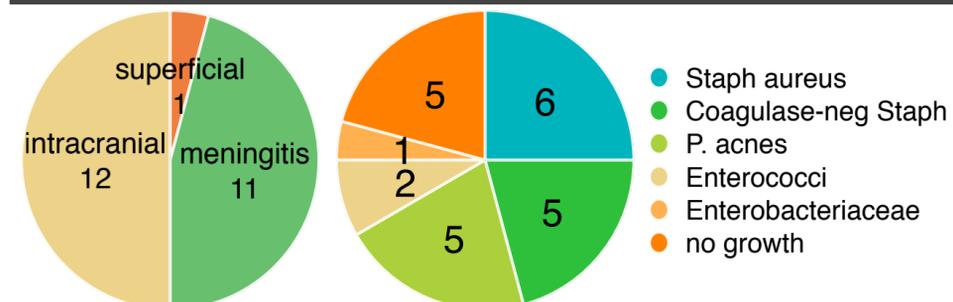
diagnosis/ indication (n=333)

brain neoplasia	71 (21%)
- meningioma	25 (7%)
chr subd hematoma	40 (12%)
hydrocephalus	30 (9%)
intracerebral hematoma	30 (9%)
brain metastasis	27 (8%)
stereotactic surgery	21 (6%)
aneurysm	17 (5%)
acute subd hematoma	16 (5%)
cranioplasty	16 (5%)
other	65 (20%)

infection rates (IR)

risk groups	IR for index OP	IR including subseq OP
overall	7.2% (24/333)	
- without EVD	5.2% (14/270)	4.6% (12/261)
- with EVD	15.9% (10/63)	16.7% (12/72)
no foreign material	7.4% (11/149)	6.9% (9/130)
- without EVD	4.2% (4/96)	1.1% (1/89)
- with EVD	13.2% (7/53)	19.5% (8/41)
foreign material	7.1% (13/184)	7.4% (15/203)
- without EVD	5.7% (10/174)	6.4% (11/172)
- with EVD	30% (3/10)	12.9% (4/31)

infection type and microbiology (n=24)



IR according to risk factors (RF), for index procedures when not otherwise specified (n=333)

emergency operation	9% (13/145) vs. 5.9% (11/188)	OR 1.5 (0.69 - 3.65), p=0.29
incorrect antibiotic prophylaxis	7.5% (14/186) vs. 6.8% (10/147)	OR 1.11 (0.51 - 2.42), p=0.84
external ventricular drainage (EVD)	15.9% (10/63) vs. 5.2% (14/270)	OR 3.45 (1.46 - 8.18), p=0.01
- EVD > 5 days	26.7% (8/30) vs. 6.1% (2/33)	OR 5.64 (1.09 - 29.14), p=0.04
any foreign material	7.2% (13/184) vs. 7.2% (11/149)	OR 0.95 (0.41 - 2.2), p=1.0
any foreign material incl. subsequent OP	7.4% (15/203) vs. 6.9% (9/130)	OR 1.07 (0.46 - 2.53), p=1.0
foreign material incl. EVD (only index OP)	8.4% (20/238) vs. 4.2% (4/94)	OR 2.12 (0.71 - 6.37), p=0.24
foreign material incl. EVD (incl subseq OP)	9.4% (23/244) vs. 1.1% (1/89)	OR 9.16 (1.22 - 68.85), p=0.01
cranioplasty	12.1% (4/33) vs. 6.7% (20/300)	OR 1.93 (0.62 - 6.04), p=0.28
VSHN (shunt)	0% (0/13) vs. 4.5% (24/320)	OR 0.93 (0.9 - 0.95), p=0.61
subsequent operation(s)	7.3% (6/82) vs. 7.2% (18/251)	OR 1.02 (0.39 - 2.76), p=1.0
BMI >25	10.9% (15/138) vs. 4.8% (8/166)	OR 2.4 (0.99 - 5.86), p=0.05
NNIS >1	3.2% (1/31) vs. 7.6% (23/302)	OR 0.4 (0.05 - 3.1), p=0.71
ASA >2	7.9% (14/178) vs. 6.5% (10/155)	OR 1.24 (0.53 - 2.87), p=0.68
wound class >2	0% (0/10) vs. 7.4% (24/323)	OR 0.93 (0.9 - 0.96), p=1.0
OP-duration > T-point	5.6% (3/54) vs. 7.5% (21/279)	OR 0.72 (0.21 - 2.51), p=0.78
age >65 years	4.4% (6/137) vs. 9.2% (18/196)	OR 0.45 (0.18 - 1.17), p=0.13

completion of follow-up

no foreign material	95% (124/130, 30d)
foreign material	97% (197/203, 3m)
	72% (146/203, 12m)

survival

with infection	without infection
96% (23/24)*	77% (189/246)

* one unrelated death

antibiotic prophylaxis (single shot, n=333)

cefamandol	299 (90%)
other	13 (4%)
missed	21 (6%)
incorrect timing	53% (165/312)
correct prophylaxis	44% (147/333)

discussion

- SSI rate at our institution was comparable to published rates
- in our series, classical risk factors were not found to be significant predictors of SSI
- significant risk factor was EVD, especially if in place for >5 days
- foreign material and BMI >25 showed a trend towards an increased IR
- as IR is strongly influenced both by the index and by subsequent operations, simply comparing IR of index procedures might be inaccurate
- since craniotomies consist of heterogeneous interventions, care must be taken when comparing rates of different institutions

conclusion

- **EVD and EVD duration is a strong risk factor for SSI in neurosurgical procedures**
- **due to heterogeneity of published data, bench marking is difficult**