

## 5 | CONCLUSION

This is the first report of clinical outcomes following Coblation™ Turbina-tor™ turbino-plasty for nasal obstruction. Clinical data from this study suggest significant improvement in both subjective (NOSE) and objective (PNIF) outcome measures, which were comparable to the microdebrider turbino-plasty technique. Medium- and long-term outcomes of this novel technique are being monitored. Prospective studies by other authors are required to assess the reproducibility of the data reported here.

### CONFLICT OF INTEREST

None.

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# Early postoperative fever in paediatric patients undergoing cochlear implant surgery

## 1 | INTRODUCTION

Early postoperative fever (EPF) is a common occurrence.<sup>1</sup> EPF may be an indication of infection and often leads to costly fever workups, which classically include white blood cell count, blood cultures, chest X-ray, urinalysis, urine culture and even a lumbar puncture.

The battery of diagnostic tests comprising the fever evaluation is not entirely benign. Evaluations are invasive and may be painful, which may in itself have a negative impact on recovery.

The purpose of this study was threefold:

- To examine the incidence of EPF in paediatric cochlear Implant (CI) surgery at our institution.
- To describe the results of the investigation and to recognise possible risk factors for developing EPF.
- To specifically examine the relation between EPF and the use of prophylactic antibiotic treatment perioperatively vs long-term antibiotic prophylaxis.

## 2 | MATERIALS AND METHODS

The study was approved by the local ethics committee.

### 2.1 | Patients

The study was a retrospective chart review of all children younger than 12 years who underwent cochlear implant (CI) surgery at Soroka Medical Center between 2004 and 2012. For each patient, data were collected, including age, sex, type of surgery, antibiotic treatment and presence of postoperative fever; fever workup results; and the presence of local complication.

### 2.2 | Prophylactic antibiotics protocol

All implanted patients received intraoperative intravenous antibiotic prophylaxis (amoxicillin-clavulanic acid 25 mg/kg) prior to the skin incision and continued with two more doses during the next 24 hours. Until 2008, the same antibiotic was continued orally (25 mg/kg  $\times$  2) for 1 week ("old protocol"). Beginning in 2009, antibiotics were stopped after 24 hours ("new protocol").

### 2.3 | Implanted devices

Implanted cochlear devices included Med-El ( $n = 64$ ), Cochlear ( $n = 49$ ) and Advanced Bionics ( $n = 47$ ).

### 2.4 | Surgical technique

All CI devices were implanted by the same surgeon (DMK). A standard post-auricular skin incision and the facial recess approach (posterior tympanotomy) were utilised. The electrode insertion into the scala tympani was achieved through a cochleostomy anterior-inferior to the round window until 2011. From 2011, the round window approach was used.

### 2.5 | Fever (definition and workup)

Body temperature was assessed postoperatively every 4 hours via the axillary route. EPF was defined as any body temperature of 38.0°C or above within 72 hour from the CI surgery. Febrile children underwent a fever workup by the otolaryngologist and paediatrician, including a complete physical examination, as well as a chest X-ray, complete blood count and urinary analysis. Urine and blood cultures were taken. Patients who developed perioperative fever were discharged after their febrile episode had ceased for at least 24 hours, and in some of the cases in which antibiotics were stopped, they were renewed.

### 2.6 | Local complications

A local complication was defined as any inflammation of the wound and was categorised as an early complication (those that occurred

### Keypoints

- Early postoperative fever after cochlear implant surgery is not uncommon.
- We assessed all paediatric patients undergoing cochlear implants and addressed the patients with postoperative fever.
- A hundred and thirty surgeries were performed; of all patients, 25 developed *early postoperative fever*.
- The workup did not identify the cause of fever in any of the patients. Fever resolved without any additional intervention.
- There was no difference in fever or infection rate in patients who received prophylactic antibiotic, whether prolonged (1 week) vs or only perioperative treatment (1 day).

within the first month after surgery) or late complication (at least 1 month after the surgery).

### 2.7 | Statistical analysis

Patients' characteristics are presented as mean  $\pm$  SD for continuous variables with normal distribution;  $n$  and categorical variables were presented as percentage. Continuous variables were examined using Student's  $t$  test. Categorical variables were compared using the chi-square test. Data were analysed using the Statistical Package for Social Sciences (IBM SPSS Chicago, USA, version 22). In all analyses, alpha level was set at 0.05.

## 3 | RESULTS

One hundred and thirty patients underwent CI surgery. Twenty-five of them underwent simultaneous bilateral cochlear implants (19.2%). Four surgeries were for post-meningitis deafness and four were following inner ear congenital malformations.

There were 57 males (43%) and 73 females (56%); 84 were Bedouin Arabs (64.6%) and 46 (35.3%) were Jews. The range age at implantation was 8 months to 6 years and mean age was  $3.43 \pm 3.33$  years. Twenty-five children (19.2%) developed postoperative fever. Table 1 presents the demographic and clinical characteristics of the implanted patients. No relation was found between the presence of fever and patients' or the procedure's characteristics (bilateral vs unilateral cochlear implant). Fever did not lengthen the postoperative hospital stay, 2 vs 2.6 days ( $P = .18$ ).

Of the patients who developed fever, 22 underwent unilateral CI; the other three patients underwent bilateral CI. Eighteen of them underwent a full investigation of fever; four patients had blood cultures taken and one patient with persistent fever reaching 40°C had a lumbar puncture performed. All examinations were normal.

**TABLE 1** Demographic and clinical data

Demographic and clinical data	+EPF	–EPF	Statistical significance (P value)
<b>Gender</b>			
Male	14 (56%)	35 (33%)	.24
Female	11 (44%)	70 (67%)	
Age mean±SD	2.6 ± 3.6	3.4 ± 3.3	.18
<b>Implantation</b>			
Unilateral (N = 105)	22 (21%)	83 (79%)	.24
Bilateral (sequential) (N = 25)	3 (12%)	22 (88%)	
Postoperative complications (N = 10)	2	8	.33

EPF, early postoperative fever.

Amoxicillin-clavulanic acid continued orally (25 mg/kg × 2) for 1 week (old protocol) was used in 44 patients. In 86 patients, the new protocol was used (stopping antibiotics after 24 hours). When comparing the groups, age and gender were similar, as was the frequency of fever and complications (Table 2).

We noted postoperative local complications in 10 patients: four had a late local complication (acute mastoiditis with subperiosteal abscess), the other six developed a local swelling—all in the early complications category. All these patients belonged to the afebrile group. In contrast, there were two postoperative complications in the febrile group. There was no correlation between postoperative local complications and the presence of early postoperative fever ( $P = .24$ ).

When studying the old vs the new prophylactic antibiotic protocol, there were two local complications in the first group, compared with eight local complications in the second group ( $P = .33$ ; Table 2).

## 4 | DISCUSSION

The present study shows two interesting findings:

- Early postoperative fever does not relate to the length of the surgical procedure; furthermore, the procedure's length does not influence the complications rate.
- The routine use of prophylactic antibiotic treatment in the elective CI surgery did not have any advantage over perioperative single doses.

**TABLE 2** Comparison of antibiotic protocols

Characteristic	Old protocol N = 44 (7 d antibiotics) (33.8%)	New protocol N = 86 (24 h antibiotics) (66.2%)	Statistical Significance (P value)
Age mean ± SD	3.72 ± 3.6	3.29 ± 3.19	.24
Gender-male (%)	20 (45.5)	37 (43)	.79
Fever (%)	6 (13.6)	19 (22.1)	.26
Postop complications (%)	2 (4.5)	8 (9.3)	.33

To the best of our knowledge, this is the first study addressing the issue of EPF among children undergoing CI surgery. The overall incidence of EPF was 19%. An infectious source for the EPF was not found in any of the patients. In addition, late infectious complications such as mastoiditis or wound infection were not associated with EPF.

Early postoperative fever in the paediatric population remains a clinical concern even though prior studies concluded that fever is a poor predictor of surgical complications.<sup>2,3</sup> Yeung et al.<sup>4</sup> reviewed 256 children undergoing elective surgery who developed EPF, and they concluded that the physician's clinical assessment, rather than degree of fever, is the best guide of the need for further diagnostic measures in most patients.

Although postoperative fever in the first 48 hours has been historically attributed to atelectasis, there is growing evidence that the fever is due to a physiological response to tissue trauma caused by an increase in the complex cascade of inflammatory cytokines.<sup>3</sup> Corkum et al.<sup>5</sup> retrospectively reviewed 6943 adult patients undergoing elective surgery and found 30.6% developed fever. The fever workup was negative, except for the urinalysis, which was positive in 19.8% of patients. The urine culture was positive in 15.7% of patients and 92.0% had a urinary catheter during surgery. Although these data come from different heterogeneous patient population than ours, it demonstrates that the urinary tract is a very important possible source of postoperative fever. Our urinalysis results were all negative.

Despite this evidence, many patients with EPF continue to be investigated in search of an infectious aetiology, at significant cost.

In our series, the complete fever workup did not reveal the aetiology of the EPF in any of the patients. There was no difference in the incidence of early or late complications between the EPF group and the patients without fever. This is in agreement with the findings by Yeung et al.<sup>4</sup> that found a number of risk factors other than infection correlating significantly with postoperative fever: long procedures, intraoperative blood transfusions and preoperative infections.

There was no difference in the incidence of infections and EPF with unilateral vs simultaneous, bilateral implantation as well as in earlier vs later years (in which operating time was reduced due to the surgeon's experience). These observations are in keeping with one study showing that the length of CI surgery was not a risk factor for an increased complication rate.<sup>6</sup>

There is controversy over use of antibiotic prophylaxis in CI surgery. The literature on this issue is quite limited and there is no convincing evidence for or against using antibiotics, prophylactically. Basavaraj et al.<sup>7</sup> studied 292 adult and paediatric patients who underwent CI. The infection rate was higher in patients who received long-term antibiotics. Hirsch et al.<sup>8</sup> retrospectively reviewed their experience with CI in 95 patients (81 adults, 14 children). The incidence of infection was 1% with the use of a single preoperative IV antibiotic; they concluded that the single dose preoperatively is sufficient for the prevention of major wound infection after CI surgery.

Our study also did not find a difference in infection rate or other complication between the two antibiotic protocols (Table 2). Perhaps, the use of long-term prophylactic antibiotics should be based on assessment of risks and benefits and intraoperative findings of each patient.<sup>9</sup>

## 5 | CONCLUSIONS

Early postoperative fever is a common occurrence after paediatric CI surgery. EPF after CI is probably not related to any kind of infection or local complication and does not seem to have any long-term significance. Medical investigation of the fever should probably be limited to an examination by the otorhinolaryngologist and a paediatrician. Additional tests should be restricted to findings on examination or cases of persistent fever. Additionally, a limited antibiotic prophylaxis protocol of 24 hours is probably sufficient.

### CONFLICT OF INTEREST

None to declare.

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# The incidence of thyroid cartilage invasion in early-stage laryngeal carcinoma: Our experience on sixty-two patients

## 1 | INTRODUCTION

Laryngeal cancer represents 4.5% of all malignancies and 28% of cancers of the upper aerodigestive tract. Pretreatment staging of laryngeal carcinoma should involve evaluation of thyroid cartilage invasion. Cartilage invasion which determines T stage in laryngeal cancer can be detected in 26%-75% of the patients and if not detected preoperatively, may cause errors in staging in 40%-50% of

the patients.<sup>1</sup> In recent TNM classification, inner cortex involvement is classified as T3 and outer cortex invasion is T4a.<sup>2</sup> Thyroid cartilage invasion is important not only for the choice of treatment but also for the prognosis of the patients. If cartilage invasion is detected, transoral surgeries cannot be performed and open laryngeal surgeries, as partial and total laryngectomy, and resection of thyroid cartilage is mandatory. Cartilage invasion in laryngeal cancer is also associated with poor treatment response and tumour recurrence.<sup>1</sup>

CT and MRI are useful tools to assess thyroid cartilage invasion preoperatively. But detection of minor thyroid cartilage invasion,