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Short Communication

Otomastoiditis: Thirteen Years of Active Surveillance in a Northern Mexican Hospital (Mexico-USA-Border): Pneumococcus as Leading Cause, and High Impact of Pneumococcal 13-Valent Conjugate Vaccine

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ABSTRACT

Background: We have published several studies related to Invasive Pneumococcal Disease, and effectiveness of Pneumococcal Conjugate Vaccines: 7-valent (PCV7) and 13-valent (PCV13). This is the first Latin American, prospective study looking for Otomastoiditis (OM) in children, and the impact of PCV13 on this disease.

Methods: Since October/1st/2005 until September/30th/2017, prospective surveillance to identify all children<16 years old with OM at the Tijuana, Mexico, General Hospital was performed. OM was diagnosed with otoscopy, and tomographic signs of OM. Bacterial identification was obtained either from mastoids and/or supramastoid abscesses, and bacterial identification by conventional cultures. Pneumococcal serotyping was performed by the Quellung Reaction (Statens Serum Institute®).

Results: Twenty cases of OM were identified. Median age at admission was 32 months (6 months–15 years). Median hospitalization days of 10 (5–115). Mastoidectomy was performed in all. Bacterial isolation was successful in 18 (85.7%). *S. pneumoniae* was isolated in 14 (77.77%). For Pneumococcal OM: before PCV7 introduction (19 months of surveillance) there were 0.158 cases per month (6A, 18C, 7F, one of each), post-PCV7 universal vaccination (61 months of surveillance) decreased to 0.114 cases per month (serotypes 19A(3), 3(2), 7F(1), 12F(1), PCV7 impact of 27.8%), and following PCV13 implementation (76 months of surveillance) dropped to 0.052 cases per month (serotypes 3(1), 33F(1), 35B(1), 24F(1), PCV13 impact of 67%), with no cases of *S. pneumoniae* serotype 19A following PCV13.

Conclusion: Although relatively uncommon, OM was associated with important morbidity (mastoidectomy) and long hospitalization. *S. pneumoniae* was the leading cause, with high impact of PCV13 (67%), and a possible disappearance of serotype 19A

Keywords: Otomastoiditis; Pneumococcal otomastoiditis; Pneumococcal conjugate vaccines

BACKGROUND

Both the 7 and 13-valent Pneumococcal conjugate vaccines (PCV-7, and PCV-13, respectively) have mostly been implemented, and proved to be highly effective in several countries to decrease Invasive Pneumococcal Disease (IPD) in children (and adults by herd effect), such as septicemia, meningitis, pleural empyema, among others [1-10]. Even though these vaccines initially were not implemented to reduce Acute Otitis Media (AOM), various studies have shown its effects on decreasing this "mucosal" disease, as a result of reducing both nasopharyngeal carriages, and the first AOM episode when administered promptly in infancy [11-14]. However, its effectiveness on decreasing Otomastoiditis (OM), a local/suppurative complication of AOM, has not been widely published [15-17].

We have performed several studies related to IPD, particularly by looking at the effectiveness of PCV13 on overall IPD, as well as on Meningitis and Pleural Empyema [18-20].

This is the first Latin American, hospital-based, prospective study looking for OM in children, and the impacts of PCV7 and PCV13 on this disease.

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METHODS

Since October/1st/2005 until September/30th/2017 (thirteen years), prospective/active surveillance to identify all children<16 years old with OM at the Tijuana General Hospital was performed.

OM was diagnosed with otoscopy confirming an AOM with/without effusion, and confirmed by tomographic signs of OM (mastoid occupancy of fluid), with/without signs of visually signs of clinical mastoid inflammation.

Bacterial isolation was obtained either from mastoids (in the operating room) and/or supramastoid abscesses (when present), and bacterial identification by conventional cultures.

For *Streptococcus pneumoniae* isolates, serotyping was performed by the Quellung Reaction (Statens Serum Institute®, Copenhagen, Denmark).

Analysis of all information was merely descriptive using Excel®.

To analyze PCV's impact on OM, we separated the number of months of surveillance in three periods: Prior to PCV7 initiation ("Pre-PCV7", 19 months of surveillance), during PCV7 immunization ("post PCV7", 61 months of surveillance), and since PCV13 implementation ("post-PCV13", 76 months of surveillance). Accordingly, PCV7 impact was estimated by comparing cases per month "pre-PCV7" vs "post-PCV7" (and the percentual changes between the two periods), while PCV13 impact by using the same estimation described but comparing "pre-PCV7" vs "post-PCV13" periods.

RESULTS

Twenty cases of confirmed OM were identified during thirteen years of prospective surveillance.

Median age at admission was 32 months (6 months–15 years). Median hospitalization days of 10 (5–115).

Mastoidectomy was performed in all patients, one patient developed OM along with meningitis (by *S. pneumoniae* serotype 19A).

Bacterial isolation was successful in 18 patients (85.7%): *Streptococcus pneumoniae* was isolated in 14 (77.77%), followed by *Streptococcus pyogenes* (2=11.1%), *Streptococcus anginosus*, and *Proteus mirabilis* (one of each) (Figure 1).

All but one patient (a child with Congenital Agammaglobulinemia with OM caused by *Proteus mirabilis*) were previously healthy children.

For Pneumococcal OM (n=14): Before PCV7 introduction ("pre-PCV7"period, 19 months of surveillance) there were 0.158 cases per month (serotypes 6A, 18C, 7F, one of each), during the "post-PCV7" period (61 months of surveillance) decreased to 0.114 cases per month (serotypes 19A(3), 3(2), 7F(1), 12F(1), an estimated PCV7 impact of 27.8%), and following PCV13 implementation ("post-PCV13" period, 76 months of surveillance) dropped to 0.052 cases per month (serotypes 3(1), 33F(1), 35B(1), 24F(1), an estimated PCV13 impact of 67%), with no cases of *Streptococcus pneumoniae* serotype 19A following PCV13 (Figures 1 and 2).

DISCUSSION

As mentioned in the Introduction, both PCV7 and PCV13 were not initially introduced to reduce AOM, however, this effect has been proved to be present in several studies [11-14].

Publications particularly searching for the effect of either PCV7 and/or PCV13 on OM are scarce [15-17].

The Italian, 15 years retrospective study done by Balsamo, et al. [15], did not show a statistical difference of OM before and an after any PCV used. However, in this publication, from all 143 patients enrolled, isolation was not reported, and many patients did not undergo mastoidectomy. However, in the study published by Marom, et al. [16], which retrospectively analyzed all causes by both uncomplicated and complicated AOM in the USA between 2001-2011, attack rates of cases of OM dropped from 0.6/100,000 to 0.32/100,000 (p=0.05) since 2009 (during implementation of PCV13), with no effect with PCV7 vaccination. Similar findings are published by Tamir, et al., from which based on their findings, PCV13 had more effect than PCV7 on Pneumococcal OM in Israel [17].

FIGURE-1
BACTERIAL IDENTIFICATION OF OTOMASTOIDITIS IN CHILDREN
(n = 18)

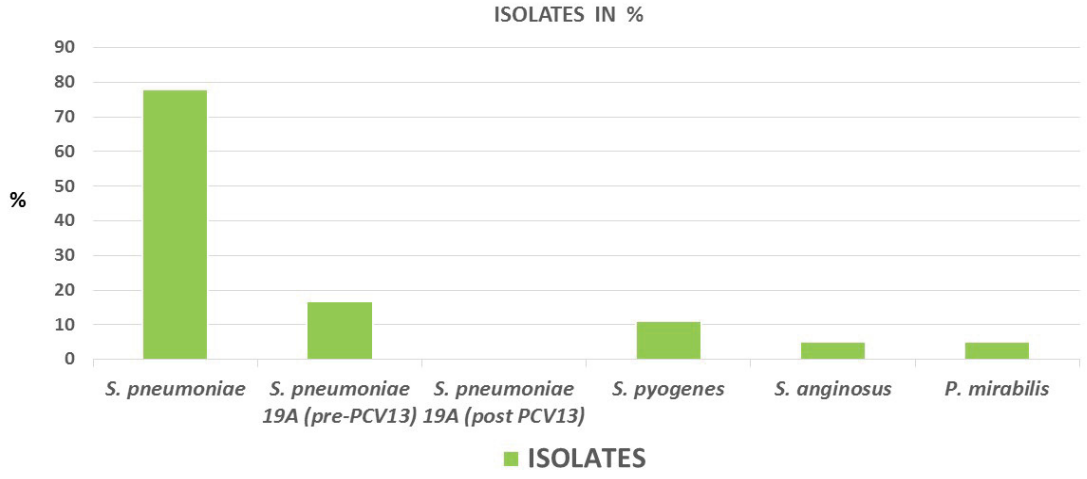

Figure 1: Bacterial identification of otomastoiditis in children (n=18).

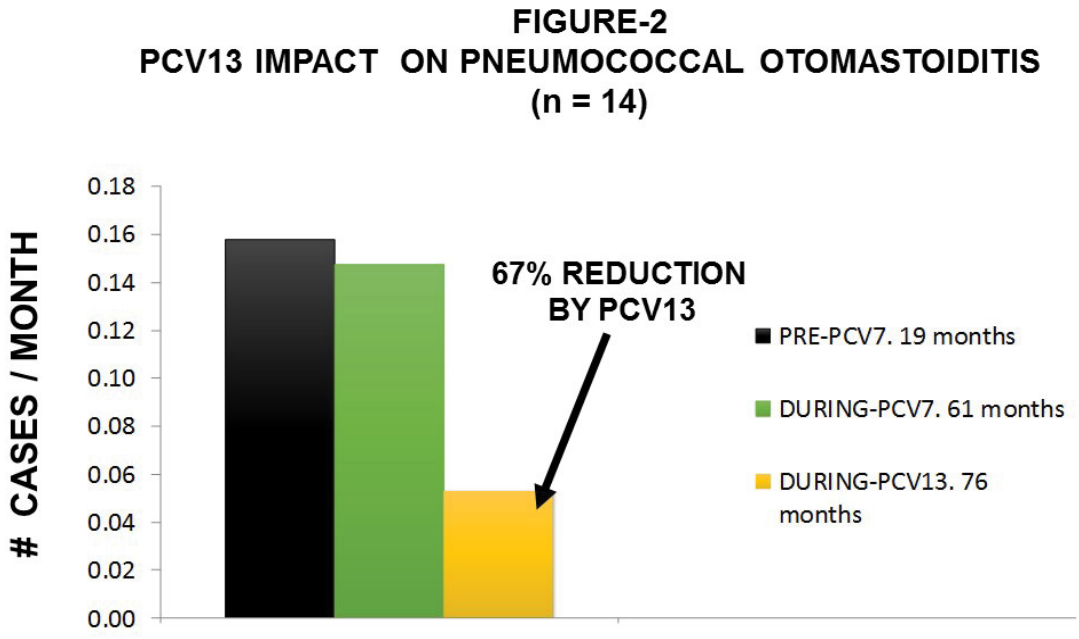

Figure 2: PCV13 impact on pneumococcal otomastoiditis (n=14).

We acknowledge that our study comes from data done only in one Hospital, nevertheless, is based on active/prospective surveillance, mastoidectomy was performed in all patients, and bacterial recovery was successful in 78% of patients. Additionally, in accordance to the study done in the USA (16), we also did not see important impact by PCV7, but higher with PCV13 (67%), and, with the advantage that in our study we only prospectively looked at Pneumococcal-culture-confirmed OM.

CONCLUSION

In this, the first Active/Prospective study searching for Bacterial OM in Latin American children, although relatively uncommon, OM was associated with important morbidity (mastoidectomy) and long hospitalization. *Streptococcus pneumoniae* was the leading cause, with high impact of PCV13. Further surveillance is needed.

ETHICS STATEMENT AND CONSENT

Our study did not require an ethical board approval from our Hospital because it did not contain human or animal trials. It was a prospective observational study, everything that has been done to all patients in this study was part of the gold standard of care.

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