The Journal of International Advanced Otology

J Int Adv Otol 2016; 12(1): 119–24 ● DOI: 10.5152/iao.2016.1807

Case Report

# Congenital Intratympanic Cholesteatoma in an Adult Patient: A Case Report and Review of the Literature

**Barbara Pedruzzi, Marta Mion, Francesco Comacchio**

Department of Otolaryngology, Azienda Ospedaliera di Padova, Padova, Italy

Congenital cholesteatoma within the tympanic membrane is an uncommon entity, with only few cases being documented. The aetiopathogenesis of this lesion is still unknown; however, when cholesteatoma develops in subjects without any history of previous ear inflammation, as in the case we report here, an embryologic origin is deeply suspected. An acquired origin is hypothesized in patients with a previous history of an inflammatory process of the external or middle ear because of the proliferation of the basal cell layer of the tympanic membrane epithelium. We report a rare case of congenital cholesteatoma of the tympanic membrane in an adult patient and review the literature

**KEYWORDS:** Congenital intratympanic cholesteatoma, intratympanic cholesteatoma, congenital cholesteatoma of the tympanic membrane, cholesteatoma of the tympanic membrane

## INTRODUCTION

Cholesteatoma within the tympanic membrane (TM) without previous otologic surgery or ear trauma is extremely rare [1]. In such cases, a congenital or embryologic origin should be considered: intratympanic membrane cholesteatoma (ITMC) is thought to be developed because of persistence of epithelial rest, which contributes to the formation of TM and the tympanic ring. Characteristically, keratin debris accumulates between the outer epidermic layer and middle fibrous layer of TM without extending into the middle ear cavity. As in any other type of cholesteatoma, early treatment is needed because it can cause progressive destruction.

## CASE PRESENTATION

A 36-year-old man was referred to our attention in February 2012 with abnormal findings in his left TM. Otomicroscopic examination revealed a whitish roundish mass on the umbo of the left TM (Figure 1), while the external auditory canal (EAC) was normal.

There was no history of otitis media, ear trauma, or otologic surgery. A pure-tone audiogram revealed a conductive hearing loss of 30 dB at A frequency of 250 Hz, 20 dB at 500–4000 Hz, 25 dB at 1000 Hz, 35 dB at 2000 Hz, and 40 dB at 8000 on the left side. The CT scan showed a 4 mm mass within the left TM, which was intact, with minimum thickening of the pars flaccida. Erosion of the ossicular chain was not evident (Figure 2, 3).

The patient underwent middle ear exploration, which confirmed the presence of a small mass within the umbo, without any middle ear involvement. The lesion was removed using a retroauricolar approach, following which a miringoplasty (underlay techinique) was performed using an autologous temporalis muscle fascia graft (Senior Author F.C.). Histopathology confirmed a cholesteatoma.

Follow-up at 21 months after the operation revealed that TM was cured and there was no evidence of recurrence (Figure 4).

Written informed consent was obtained from the patient for publication of this case report and accompanying images. All diagnostic and therapeutic procedures were performed with patient's consent and respecting ethical principles of our institutional and national committee.

## DISCUSSION

Intratympanic membrane cholesteatoma can occur as a complication of otologic surgery [1]. We should suspect a congenital form in cases with an early age without a history of ear trauma, surgery, or middle ear infection. There are diagnostic criteria for the clinical diagnosis of congenital middle ear cholesteatoma (i.e., development behind an intact normal looking TM, without a previous history of aural infections, and arising from epithelial inclusions), but there are none for congenital ITMC [2].

**Corresponding Address:** Barbara Pedruzzi E-mail: barbarengy@hotmail.com

**Submitted:** 10.11.2015 **Revision received:** 27.01.2016 **Accepted:** 28.01.2016

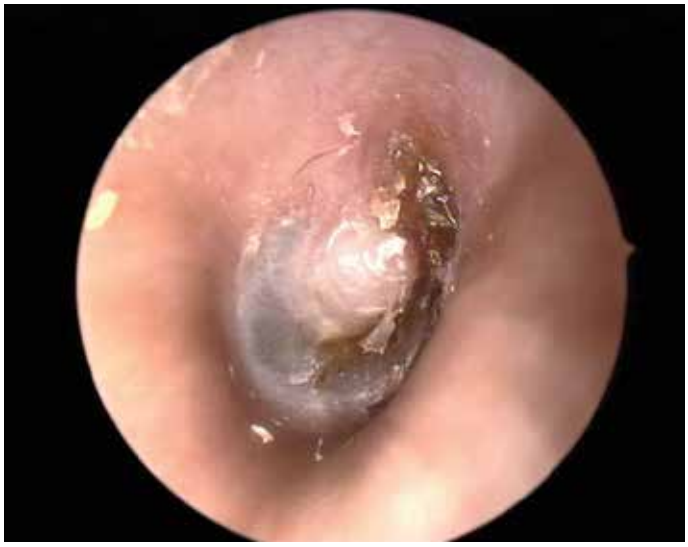

**Figure 1.** Preoperative otomicroscopic findings

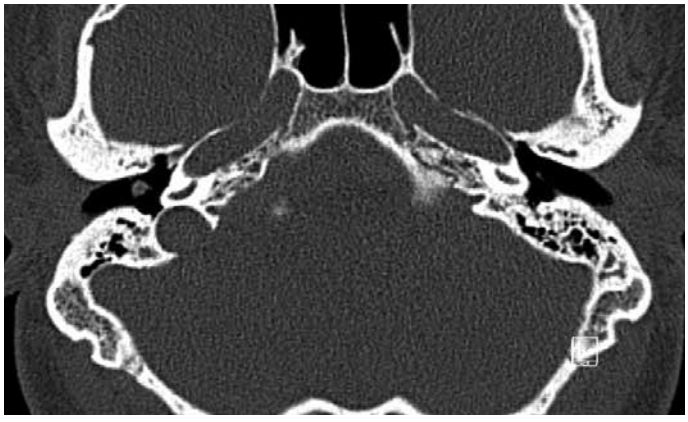

**Figure 2.** CT findings (axial view)

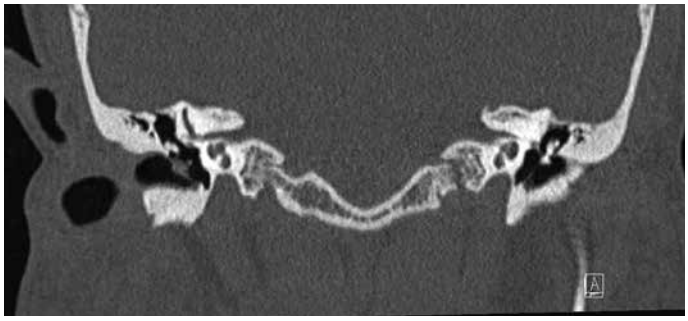

**Figure 3.** CT findings (coronal view)

In 1936, Teed [3] cited the first five cases of ITMC to support the theory of a congenital origin of cholesteatomas. From the English literature, he cited the first case reported by Hinton in 1863 [4] and one other case.

We identified a list of potential citations for inclusion in this review, following which the titles and abstracts on this list were screened by two independent reviewers.

All the retrieved full-texts were included in the review by consensus of all the authors (Figure 5).

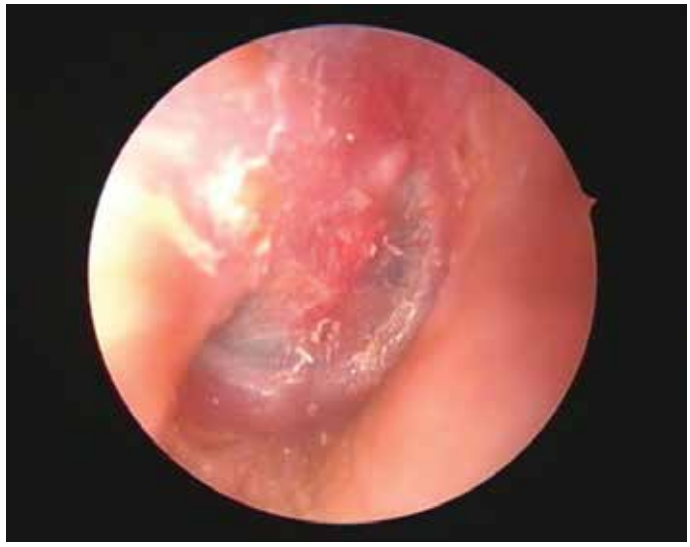

**Figure 4.** Postoperative otomicroscopic findings (at 2 months follow-up after the operation)

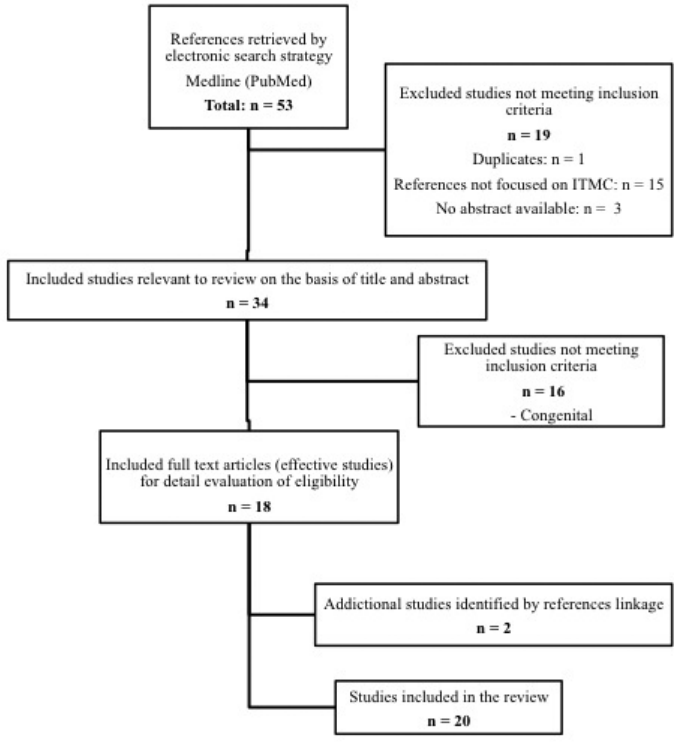


**Figure 5.** Flow diagram

As a quality assessment strategy, the included studies were methodologically appraised according to the National Institute for Health and Clinical Excellence's levels of evidence (Table 1): all the studies could be categorized as evidence level 3.

We analyzed the data from these cases, including our own case, to study their demographic details, and clinical features and management, for a total of 42 patients and 20 articles, including our own research (Table 2). Table 2 summarizes the data found in the English literature [5-24].

**Table 1.** Grading the evidence statements

| Level of evidence | Type of evidence |
|---|---|
| 1++ | High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias. |
| 1+ | Well-conduced meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias. |
| 1– | Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias.* |
| 2++ | High-quality systematic reviews of case–control or cohort studies. |
| | High-quality case–control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is casual. |
| 2+ | Well-conducted case–control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is casual. |
| 2– | Case–control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is casual.* |
| 3 | Non-analytical studies (for example, case reports, case series). |
| 4 | Expert opinion, formal consensus. |

*Studies with a level of evidence " – " are not used as a basis for making recommendations.
RCT: randomized controlled trial

The age range was 5 months to 57 years, with 27 (64.3%) cases involving patients less than 4 years of age, out of which seven (16.7%) were 1-year old or less. There was a history of one or more episodes of otitis media (n=14) when ITMC was noticed on otoscopy. The lesion was first noted by pediatricians (n=14), by general practitioners (n=4), or by otolaryngologists (n=16). In three cases, the analyses were conducted post-mortem during autoptic exams [9]. This highlights the need for routine otoscopy by primary care physicians to detect abnormalities and make an early referral to otolaryngologists. ITMC should always be considered in the differential diagnosis of white lesions in TM. Otomicroscopy can help differentiate ITMC from tympanosclerosis. Only in one case had the lesion occupied the whole TM, while the umbo was involved in nine patients; this region is the most depressed part of TM, where the manubrium of the malleus is firmly attached to the medial surface of the membrane itself. There was single ITMC for 31 cases (n=31), while six patients had two or more lesions. Three cases were bilateral. Where audiometry was documented (n=16), they had either normal hearing or mild conductive hearing loss, as in our case. Where tympanometry was performed (n=9), it was either normal or showed decreased compliance with or without negative middle ear pressure. As most of these children were very young, the tests were difficult to perform and to be relied upon. CT scan was performed in 18 patients, including our case: only in two patients did the imaging evidence an involvement of the middle ear cavity. In our case, CT showed a thickened area of TM with no middle ear extension.

In six cases, a period of observation (mean 8 months and 15 days) proceeded the surgery, which varied from excision of the involved part of TM along with ITMC with (n=7) or without (n=13) myringoplasty to enucleation of ITMC alone (n=3). The surgical approaches included endoaural (n=13), transcanal (n=8), and retroauricolar (n=3). Temporalis fascia grafts (n=5), perichondrial tragal tissue (n=1), or fat graft (n=1) were used for the miringoplasties. When the fibrous layer of TM was intact, grafting was not required. Ossicular involvement was evident in three cases. Where data on the duration of follow-up was available (n=23), it ranged from 1 month to 31 years (mean 14.8 months) and with two recurrences.

We also evaluated ITMC found in five of the 243 temporal bones with chronic otitis media, observed in a total of three patients, reported by Jaisinghani et al [9]. Two cadavers had bilateral ITMC in symmetric quadrants of TM, and the remaining cadaver with unilateral ITMC had been operated on previously for a cholesteatoma of the opposite ear. All these temporal bones had granulation tissue and fluid in the middle ears and mastoids with TM retraction and ossicular destruction, providing documentary evidence of a chronic inflammatory process and a very doubtful congenital origin of their ITMC.

Only six cases of the 39 subjects were adults, including our patient, but two of them [9] presented a history of chronic otitis media, so they could not be classified as congenital; therefore, we analyzed four adult patients. The age range was 20 to 54 years, and there was no history of otitis media when ITMC was noticed on otoscopy. The lesion was first noted by general practitioners (n=1) or otolaryngologists (n=3). The pars flaccida was not involved, whereas the lesion was present within the umbo in two subjects. All of the four adults showed single monolateral ITMC. Where audiometry was documented (n=4), they had either normal hearing, in one case, or mild conductive hearing loss, in three cases, as in our case. Where tympanometry was performed (n=2), it was either normal or showed decreased compliance with or without negative middle ear pressure. CT scan was performed in all the patients, including ours: only one evidenced an involvement of the middle ear cavity. There was no period of observation in any of the cases, and the surgical approaches were specified in three articles (two transcanal and one retroauricolar). Ossicular involvement was not evident in any case. Miringoplasty was performed in three patients. Where data on the duration of follow-up was available (n=3), it ranged from 1 to 21 months, without recurrences.

Tympanic membrane consists of three layers: the epidermis, whose ultrastructure was found to correspond to the findings in the epidermis of normal skin; the lamina propria, containing loose connective tissue, vessels, nerves, and two layers of collagen fibrils (also in the pars flaccida); and the lamina mucosa. In the pars flaccida, the mucosal layer consisted of simple squamous cells with microvilli. All through the pars tensa, there were cells of varying height, often pseudostratified columnar cells, with a large number of cilia and secretory granules.

As initially postulated by Jo [24] and popularized by Derlacki [25], the key to the diagnosis of a "congenital" cholesteatoma is the absence of a history of local trauma or infection. More precisely, we can talk about cholesteatoma as congenital if faced with [23]:

**Table 2.** Cases of ITMC, including ours

| Author | Age | OH | First | Site | Single | Mono. | Au | Ty | CT | Surg/obs | Appr. | Chain | MPL | FU | Rec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poncet and Fournier 1971 [5] | 30 months | – | Paed | PS | Yes | Yes | | | – | Surg | Endoau | | | | |
| Smith and Moran1977 [6] | 3 years | + | Paed | A | Yes | Yes | | | | Surg | | | No | 2 months–6 years | No |
| | 2 years | + | Paed | A | Yes | Yes | | | | Surg | | | No | | No |
| | 13 months | + | Paed | P | Yes | Yes | | | | Surg | | | No | 1 year | No |
| Sobol et al. 1980 [7] | 6 months | + | | Multiple | No | Yes | | | | Surg | Endoau | | Yes | | |
| | 13 months | + | | P | Yes | Yes | | | | Surg | Endoau | | | | |
| | 16 months | + | | PI | Yes | Yes | | | | Surg | Endoau | | | | |
| | 27 months | + | | PI | Yes | Yes | | | | Surg | Endoau | | | | |
| | 36 months | + | | I | Yes | Yes | | | | Surg | Endoau | | | | |
| Weber and Adkins 1997 [8] | 14 years | – | ENT | A | Yes | Yes | – | | | Surg | Transcan | – | | 1 year | No |
| | 1 year | – | Paed | PI | Yes | Yes | – | | | Surg | | – | | | No |
| | 3 years | – | GP | P | Yes | Yes | – | | | Surg | | – | | | No |
| **Jaisinghani et al. 1998 [9]** | **57 years** | **+** | **AP** | **A (left)+AS (right)** | **Yes** | **No** | **+** | **b** | | **PM** | | **+** | | | |
| | **56 years** | **+** | **AP** | **U** | **Yes** | **No** | | | | **PM** | | **+** | | | |
| | 16 years | – | AP | PS | Yes | Yes | | | | PM | | + | | | |
| **Rappaport et al. 1999 [10]** | **34 years** | **–** | **ENT** | | **Yes** | **Yes** | **+** | **b/c** | **–** | **Surg** | | **–** | **Yes** | **1 month** | **No** |
| Gurr et al. 2001 [11] | 8 years | + | ENT | | No | Yes | + | | | Surg | | – | | | |
| Pasanisi et al. 2001 [12] | 4 years | – | Paed | PS | Yes | Yes | + | a | – | Surg | Retroau | – | Yes | 3 aa | No |
| | 7 years | – | GP | U | Yes | Yes | – | a | | Obs 4 months–surg | Endoau | – | No | 27 months | No |
| Kim and Haupert 2002 [13] | 11 months | + | ENT | Lateral | No | Yes | + | | | Surg | | | | | |
| Reddy et al. 2006 [14] | 12 months | – | GP | 1 U+1 AI | No | Yes | | | – | Obs 4 months–surg | Endoau | – | No | 6 months | No |
| Suzuki et al. 2007 [15] | 7 months | – | ENT | 1 I+1 P | No | Yes | | | – | Obs 9 months–surg | Endoau | – | No | 13 months | Yes |
| **Murphy and Riera March 2008 [16]** | **20 years** | **–** | **ENT** | **PS/PI** | **Yes** | **Yes** | **–** | | **–** | **Surg** | **Transcan** | **–** | **Yes** | | **No** |
| Yoshida et al. 2009 [17] | 3 years | – | ENT | U | Yes | Yes | + | | – | Surg | Endoau | – | No | | |
| | 3 years | – | ENT | W | Yes | Yes | | | + | Surg | Endoau | | | 1 year | No |
| Shu et al. 2010 [18] | 10 years | – | ENT | Central | Yes | Yes | – | a | | Surg | Transcan | – | | | |
| Atmaca et al. 2010 [19] | 2 years | – | Paed | PI | Yes | Yes | | a | – | Surg | Transcan | – | No | 3 months | No |
| Grindle et al. 2011 [20] | 2 years | – | Paed | | No | No | | | | Surg | | – | | | |
| | 7 months | – | Paed | PS | Yes | Yes | – | a | – | Surg | Transcan | | Yes | 2–8–13 months | Yes |
| | 54 months | – | Paed | | | | | | | | | | | 19 months | |
| | 18 months | + | Paed | | | | | | | | | | | 20 months | |
| | 34 months | + | Paed | | | | | | | | | | | 1 month | |
| | 107 months | + | Paed | | | | | | | | | | | 1 month | |
| | 26 months | + | Paed | | | | | | | | | | | 0 month | |
| Lee and Park2011 [21] | 4 years | – | ENT | Central | Yes | Yes | | | – | Surg | Transcan | – | No | 1 year | No |
| Matsuda et al. 2012 [22] | 3 years | – | ENT | PS | Yes | Yes | | a | – | Surg | Retroau | – | Yes | 31 months | No |
| | 2 years | – | ENT | AI | Yes | Yes | + | | – | Surg | Transcan | – | | 2 years | No |
| **Casale et al. 2012 [23]** | **54 years** | **–** | **GP** | **Central** | **Yes** | **Yes** | **–** | **a** | **+** | **Surg** | **Transcan** | **–** | **No** | **2 month** | **No** |
| Jo et al. 2013 [24] | 25 months | – | ENT | U | Yes | Yes | | | – | Obs 1 month–surg | Endoau | – | No | 6 months | No |
| | 5 months | – | ENT | PS | Yes | Yes | | | – | Obs 7 months–surg | Endoau | – | No | | No |
| | 26 months | – | ENT | P | Yes | Yes | | | – | Obs 26 months–surg | | – | No | | No |
| **Our case** | **36 years** | **–** | **ENT** | **U** | **Yes** | **Yes** | **+** | | **–** | **Surg** | **Retroau** | **–** | **Yes** | **21 months** | **No** |

OH: otologic history (+/- for otitis media); First, doctors who first noticed a whitish lesion on the drum; Paed: pediatrician; GP: general practitioner; ENT: ear nose throat; Site, location of the cholesteatoma on the tympanic membrane; A, anterior part of the pars tensa; P, posterior; I: inferior; U: umbo; AI: anteroinferior; PI: posteroinferior; PS: posterosuperior; W: whole of the pars tensa; Mono: monolateral; Au: audiometry (– normal, + hearing loss); Ty: tympanometry; CT: computed tomography (+ middle ear cavity involved); Surg/obs: surgery/observation; PM: post-mortem; Appr: approach; Endoau: endoaural; Transcan: transcanal; Retroau: retroauricolar; Chain: ossicular chain (– intact, + eroded); MPL: myringoplasty; FU: follow-up; Rec: recurrence. In bold, adult patients

- a white mass inserted into a normal pars tensa, without connection with the pars flaccida and/or promontorium;
- normal pars flaccida;
- no prior history of otorrhea or TM perforation;
- no previous otologic procedures or trauma.

Five studies [6, 7, 11, 13, 20] described a total of 14 cases of 36 pediatric patients with a history of recurrent otitis media; however, they were classified as "congenital" because they did not show anamnestic records of otorrhea, TM perforation, previous otologic procedures, or ear trauma. In all the living adult case's ITMCs, we did not find any otologic history (or previous otitis media episodes) and no inflammatory processes were found intraoperatively.

The etiopathogenesis of congenital ITMC is still unknown and seems to be unrelated to the middle ear congenital cholesteatoma [26]. According to the papillary proliferation theory [27, 28], cholesteatoma of TM may develop by epithelial proliferation in response to an inflammatory process, as in the case of previous otitis. This theory is supported by some authors based on the evidence of recurrent otitis media in the children they presented [7, 8], but according to Casale's definition [23], the evidence of a previous inflammatory process makes doubtful the congenital nature of the mass.

When cholesteatoma develops in subjects without any history of a previous inflammatory process of the external or middle ear, like in the case reported here, an embryologic origin is deeply suspected. This could be explained by the persistence of an epidermoid formation (derivative of the first branchial groove) that normally regresses after the 33rd week of gestation [3, 29- 31]. Furthermore, the development of a congenital cholesteatoma could be due to the permanence of ectodermal cells, which normally participate in the formation of TM [31]. It has also been postulated that congenital cholesteatoma develops from an alteration of the cell growth control and an alteration of the spatial organization of the epithelial tissue [32].

Although congenital ITMC is rare, we should keep in mind the possibility of its presence whenever we notice a whitish spot on TM. Primary care physicians and pediatricians should routinely perform otoscopy during every visit. Even if ITMC is most commonly seen in children less than 4 years of age, it can also occur on TM of adults. The earlier it is discovered, the easier it is to perform surgical removal and to lower the chance of middle ear involvement.

**Informed Consent:** Written informed consent was obtained from patients/patients' parents/ the parents of the patients/patient who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept - B.P.; Design - B.P., M.M.; Supervision - F.C.; Resources - M.M.; Materials B.P.; Data Collection and/or Processing - B.P., M.M.; Analysis and/or Interpretation - M.M., B.P., F.C.; Literature Search - B.P., M.M.; Writing Manuscript - M.M.; Critical Review - F.C.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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