Explaining Sinus and Ear Pressure/Pain to Patients

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Combined, sinus and ear pressure/pain is one of the most common complaints in daily practice. That does not necessarily mean its dynamics are well understood by the patient, of course.

You may find, however, that helping patients to understand those dynamics encourages compliance with treatment and offers valuable rationale when turning down demands for antibiotic prescriptions that you deem to be unnecessary. This leads not only to more satisfied patients (who are therefore more likely to return to your facility), but also bolsters our fight against irresponsible use of antibiotics and the resultant growth of resistance.

I have found success by trying to explain the law of LaPlace to my patients.

I start by drawing a cube with an open sideline pipe which maintains free air flow (**Figure 1**).

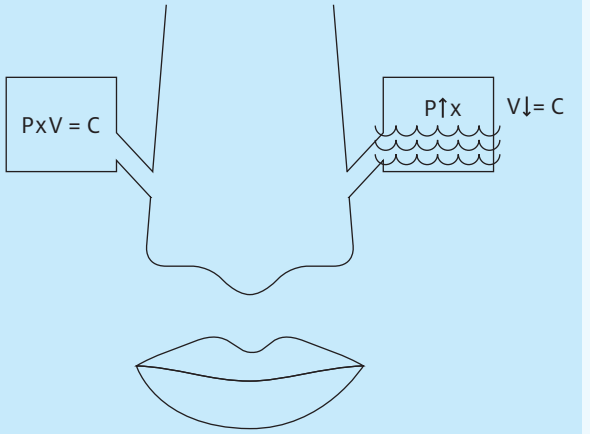
The cube, which I now compare to any empty space in the body, including sinuses and middle ear, can equalize its pressure to the outside through an open pipe. Now, if for any reason (such as congestion or anatomical abnormalities) the pipe closes, the cube becomes a *closed* space, which has a constant number (C) when pressure (P) is multiplied by volume (V).

The entire process can be expressed as in the following equation:

Law of LaPlace
P x V = C

The net effect is that if for any reason the pressure goes up, the volume has to go down, and vice versa.

Figure 1.



This ties back in with the common complaint of sinus and/or ear pressure or pain. When there is an upper respiratory infection, most of the natural ostia of the sinuses are closed. Multiple empty spaces of sinuses covered by active mucosa are now subject to the law of LaPlace.

If, due to congestion of the mucosa and/or secretion of inflammatory products, the volume of the sinus cavity *decreases*, then the pressure inside of that cavity (sinus, in this example) will rise. The patient would experience this as sinus pressure or pain.

A prime example of how this manifests would be the patient who has an upper respiratory infection during a plane ride. A change in cabin pressure will have a fast effect over the already closed sinus space, and one will feel immediate pressure or pain. (It is to be noted that changes in cabin pressure will exert different force depending on whether the plane is taking off or landing.)

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PEARLS FROM PRACTICE

Imagine that the cube in our diagram has one expandable side—like the middle ear with tympanic membrane. When the eustachian tube is closed or has malfunction, the pressure change inside the now closed middle ear space will cause bulging or retraction of the eardrum to adjust, per the law of LaPlace.

When more compensation is needed, the middle ear mucosa will secrete or shrink, depending on pressure changes, and cause serous otitis media, hearing change and pain, or tympanic perforation when tympanic membrane compensation fails.

This explanation is usually appreciated by my patients, who then realize that most of their symptoms could be prevented by maintaining the opening of natural ostia of the cavity; this includes use of decongestants and, if that proves unsuccessful over the long term, surgical intervention to open or create an ostium.

The patient will also realize that the role of antibiotics would be a very limited one—if they have any role at all. ■

GCA, continued from page 18.

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