

Tonsillectomy may be an indicator of low vitamin D status, a risk factor for cancer later in life

William B. Grant

Received: 5 November 2008 / Accepted: 10 March 2009 / Published online: 2 April 2009
© Springer Science+Business Media B.V. 2009

Sir,

The recent report, that the history of tonsillectomy was a risk factor for breast cancer in younger women but not in older women living in New York State [1] is the latest in a number of papers reporting a history of tonsillectomy associated with increased risk of cancer. It was stated by Brasky et al. [1] that tonsillectomy could either be etiologically related to cancer or a proxy for another etiologic agent.

In this letter, the hypothesis is presented that tonsillectomy is likely a proxy for low serum 25-hydroxyvitamin D [25(OH)D], a risk factor for breast [2] and other cancers linked to tonsillectomy in [1]: prostate [3] cancer, leukemia [4], and lymphoma [5]. Low serum 25(OH)D is also a risk factor for pre-eclampsia during pregnancy [6], which was noted as correlated with risk of breast cancer [1].

Pediatric tonsillectomies were generally performed due to chronic pharyngitis, although the more common reason currently is sleep-disordered breathing [7]. For adults, chronic sore throats are the most common reason with upper airway obstruction second [8]. A study in Sweden found the presence of a broad repertoire of toll like receptors (TLRs) in T cells in the tonsils of children with recurrent tonsillitis, along with infection-dependent alterations in TLR expression [9].

There is an increasing evidence that vitamin D reduces the risk of bacterial and viral infections. The 1,25-dihydroxyvitamin D metabolite of vitamin D induces the production of human cathelicidin, LL-37, which has antimicrobial and antiendotoxin properties [10]. TLRs are

involved in triggering of a vitamin D-mediated human antimicrobial response [11].

There are several papers reporting that early-life solar ultraviolet-B (UVB) irradiance is a risk reduction factor for both infectious diseases and cancer [3, 12]. For breast cancer, a study in Canada found a significant risk reduction for outdoor activities in youth, with decreasing the risk reduction with advancing age [12]. There is also evidence that serum 25(OH)D reduces risk of breast cancer later in life [2].

In [1], a possible connection proposed between tonsillectomy and cancer was increased inflammation. In a recent hypothesis paper, I suggested that viral infections preventable by vitamin D early in life such as the Epstein-Barr virus led to increased risk of several types of cancer later in life based on correlations of mortality rates with latitude, an index of wintertime solar UVB and vitamin D in the United States [13]. While nasopharyngeal cancer was not among those cancers, the Epstein-Barr virus is a risk factor for nasopharyngeal cancer [14]. Thus, it is likely that reducing the risk of infection would reduce the observed inflammation with respect to tonsillitis.

Thus, the link between tonsillectomy and increased risk of breast cancer may be due to low solar UVB irradiance and vitamin D, especially in childhood and youth.

Disclosure I receive funding from the UV Foundation (McLean, VA), the Vitamin D Society (Canada), and the European Sunlight Association (Brussels).

References

1. Brasky TM, Bonner MR, Dorn J et al (2009) Tonsillectomy and breast cancer risk in the Western New York Diet Study. *Cancer Causes Control* 20:369–374. doi:10.1007/s10552-008-9251-5

W. B. Grant (✉)
Sunlight, Nutrition, and Health Research Center (SUNARC),
P.O. Box 641603, San Francisco, CA 94164-1603, USA
e-mail: wbgrant@infionline.net
URL: www.sunarc.org

2. Garland CF, Gorham ED, Mohr SB et al (2007) Vitamin D and prevention of breast cancer: pooled analysis. *J Steroid Biochem Mol Biol* 103:708–711. doi:[10.1016/j.jsbmb.2006.12.007](https://doi.org/10.1016/j.jsbmb.2006.12.007)
3. John EM, Koo J, Schwartz GG (2007) Sun exposure and prostate cancer risk: evidence for a protective effect of early-life exposure. *Cancer Epidemiol Biomarkers Prev* 16:1283–1286. doi:[10.1158/1055-9965.EPI-06-1053](https://doi.org/10.1158/1055-9965.EPI-06-1053)
4. Giovannucci E, Liu Y, Rimm EB et al (2006) Prospective study of predictors of vitamin D status and cancer incidence and mortality in men. *J Natl Cancer Inst* 98:451–459
5. Hughes AM, Armstrong BK, Vajdic CM et al (2004) Sun exposure may protect against non-Hodgkin lymphoma: a case-control study. *Int J Cancer* 112:865–871. doi:[10.1002/ijc.20470](https://doi.org/10.1002/ijc.20470)
6. Bodnar LM, Catov JM, Simhan HN, Holick MF, Powers RW, Roberts JM (2007) Maternal vitamin D deficiency increases the risk of preeclampsia. *J Clin Endocrinol Metab* 92:3517–3522. doi:[10.1210/jc.2007-0718](https://doi.org/10.1210/jc.2007-0718)
7. Smith SL, Pereira KD (2007) Tonsillectomy in children: indications, diagnosis and complications. *ORL J Otorhinolaryngol Relat Spec* 69:336–339. doi:[10.1159/000108364](https://doi.org/10.1159/000108364)
8. Hoddeson EK, Gourin CG (2009) Adult tonsillectomy: current indications and outcomes. *Otolaryngol Head Neck Surg* 140:19–22. doi:[10.1016/j.otohns.2008.09.023](https://doi.org/10.1016/j.otohns.2008.09.023)
9. Mansson A, Adner M, Cardell LO (2006) Toll-like receptors in cellular subsets of human tonsil T cells: altered expression during recurrent tonsillitis. *Respir Res* 7:36
10. Mookherjee N, Rehaume LM, Hancock RE (2007) Cathelicidins and functional analogues as antiseptics molecules. *Expert Opin Ther Targets* 11:993–1004. doi:[10.1517/14728222.11.8.993](https://doi.org/10.1517/14728222.11.8.993)
11. Liu PT, Stenger S, Li H et al (2006) Toll-like receptor triggering of a vitamin D-mediated human antimicrobial response. *Science* 311:1770–1773. doi:[10.1126/science.1123933](https://doi.org/10.1126/science.1123933)
12. Knight JA, Lesosky M, Barnett H, Raboud JM, Vieth R (2007) Vitamin D and reduced risk of breast cancer: a population-based case-control study. *Cancer Epidemiol Biomarkers Prev* 16:422–429. doi:[10.1158/1055-9965.EPI-06-0865](https://doi.org/10.1158/1055-9965.EPI-06-0865)
13. Grant WB (2008) Hypothesis-Ultraviolet-B irradiance and vitamin D reduce the risk of viral infections and thus their sequelae, including autoimmune diseases and some cancers. *Photochem Photobiol* 84:356–365. doi:[10.1111/j.1751-1097.2007.00266.x](https://doi.org/10.1111/j.1751-1097.2007.00266.x)
14. Deyrup AT (2008) Epstein-Barr virus-associated epithelial and mesenchymal neoplasms. *Hum Pathol* 39:473–483. doi:[10.1016/j.humpath.2007.10.030](https://doi.org/10.1016/j.humpath.2007.10.030)