

## Surgical removal of the tonsils and appendix associated with risk of early heart attack

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The surgical removal of the appendix and tonsils before the age of 20 was associated with an increased risk of premature heart attack in a large population study performed in Sweden. Tonsillectomy increased the risk by 44% (hazard ratio 1.44) and appendectomy by 33% (HR 1.33). The risk increases were just statistically significant, and were even higher when the tonsils and appendix were both removed. However, there was no risk association evident when the operations were performed in people over the age of 20.

Both the appendix and tonsils are lymphoid organs and thus components of the body's [immune system](#), albeit of modest importance. The recurrence of tonsillitis and [appendicitis](#) - caused by infection - are the usual reasons for removal. Behind the study lay evidence that removal was associated with moderate long-term effects on the immune system and alterations in risk for some [autoimmune disorders](#). Studies suggest that between 10 and 20% of all young people have tonsils or appendix removed.

"Given the strong biological and [epidemiological evidence](#) linking inflammation with [coronary heart disease](#)," said investigator Dr Imre Janszky from the Department of Public Health Science of the Karolinska Institute in Stockholm, "one might anticipate that surgical removal of the tonsils and appendix, with their consequent effects on immunity, might also have a long-term effect on CHD. However, we were aware of no studies evaluating the potential effects of appendectomy or tonsillectomy on atherosclerosis or CHD risk."

The study, published online today in the [European Heart Journal](#), examined the national health records of every Swedish resident born between 1955 and 1970 and identified each one who had had tonsils and/or appendix removed. Each of these "cases" was then matched with five randomly chosen "controls" who had not had the operations. These subjects were then followed up through the [health records](#) for an average of 23.5 years to cross-check for the occurrence of fatal or non-fatal [heart attack](#) (acute myocardial infarction, AMI). Because the appendix and tonsils appear to have reduced function after adolescence, the primary analyses were restricted to individuals below the age of 20 at the time of surgery, which amounted to 54,449 appendectomies and 27,284 tonsillectomies.

Results showed that these cases had a higher prevalence of AMI than the controls, with 89 of the appendectomies and 47 of the tonsillectomies experiencing an AMI within the follow-up period. When compared with controls, the added risk was calculated as a hazard ratio of 1.33 (95% confidence interval 1.05 – 1.70) for [appendectomy](#) and 1.44 (95% CI 1.04 – 2.01) for [tonsillectomy](#).

Dr Janszky, the study's first author, emphasises that the absolute numbers of AMI cases in the study are small, with only slightly more than 400 and 200 total cases of AMI in more than 7.5 million and nearly 4 million person-years of follow-up. "As expected from the young age of the population," he says, "the observed moderate increases in relative risk actually corresponded to very small risk increases in absolute terms." The investigators also note that the study population, despite its size, was restricted to childhood exposure, with participants still relatively young at the end of follow-up. "Consequently," they write, "we cannot directly extrapolate our findings to cases of AMI that occur among older men or women, in whom risk is highest."

In explaining the results the authors also implicate some "complex" long-

term effect of the immune system, noting that the appendix and [tonsils](#) are secondary lymphoid organs whose removal can affect several aspects of immune activity, including decreased production of immunoglobulins. They also note that atherosclerosis, the underlying pathophysiology of AMI, is widely considered to be an inflammatory process.

"In the light of our current knowledge on the complex relationship between atherosclerosis and the immune system, the findings are biologically plausible," said Dr Janszky. "There is already some evidence that removal of the spleen, another secondary lymphoid organ, is also associated with accelerated atherosclerosis and increased cardiovascular risk."

Provided by European Society of Cardiology

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