

The Inverse Relationship Between Body Mass Index and the Presence of a Varicocele: An Interesting Epidemiological Finding

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Varicoceles, characterized as abnormal dilatation of the veins of the pampiniform plexus and present in 15–20% of men, are the most common abnormal finding among men presenting with infertility,¹ yet controversy exists regarding their etiology. It is likely that a combination of factors play a role in the formation of varicoceles. Several anatomical features of the testicular venous system may contribute to excessive hydrostatic pressure that is transmitted caudally to the scrotal pampiniform plexus, causing dilatation and tortuosity of these vessels.

Approximately 90% of varicoceles are on the left side. The incidence of bilaterality is anywhere from 15% to 50%, but isolated right varicoceles are fairly rare. One theory postulates that the length of the left internal spermatic vein and the angle at which it drains into the left renal vein can result in increased hydrostatic pressure. The anatomy of the left spermatic vein system in conjunction with the upright posture of humans may also predispose them to varicocele from the effects of gravity and the length of the internal spermatic veins. Absent or incompetent valves within the internal spermatic vein also have long been thought to contribute to the pathophysiology of varicocele. Standard anatomy texts describe valves within the internal spermatic vein. However, in a study of 659 consecutive patients who underwent venography for evaluation of idiopathic left varicocele, 73% had absent internal spermatic venous valves, while 26% had competent valves but absent insertions of the left spermatic vein at the typical point on the left renal vein plus retrograde flow over persistent collateral anastomoses.² Therefore, the complete absence of valves, the presence of dysfunctional valves or the presence of functional valves in conjunction with abnormal anatomical features seem to be associated with varicocele formation. The location of the left renal

vein between the superior mesenteric artery and aorta may also predispose the vein to compression (the so-called “nutcracker” phenomenon), leading to potential development of collateral drainage and increased venous pressure within the internal spermatic vein.³ Distal compression of the left common iliac vein by the common iliac artery may also occur, thereby impeding flow through the deferential and external spermatic veins, facilitating dilatation of the affected veins.

Although the precise etiology of varicocele remains incompletely understood, anecdotal experience suggests that varicoceles are more prevalent in lean men. Is this the result of clinical diagnostic bias of decreased detection of varicocele due to adipose tissue in the spermatic cord or does body weight really alter the anatomical factors? To determine if this observation is indicative of a true relationship between weight and the presence of varicocele, clinical studies have been conducted to address this issue. Handel et al conducted a retrospective study of 3,213 patients presenting for evaluation of male factor infertility.⁴ The prevalence of varicocele was 34% by physical examination. All patients were stratified by body mass index (BMI). The investigators found that significant differences were seen in varicocele prevalence among the normal BMI, overweight and obese groups. Patients with normal BMI had a significantly higher prevalence of varicocele than overweight or obese patients.⁴ Nielsen et al reported that multivariate logistic regression analysis revealed a statistically significant inverse relationship between BMI and the presence of varicocele in a study of more than 2,000 patients.⁵ More recently, a total of 1,050 young males attending the Navy Recruit Training Center were evaluated by Tsao et al from their physical screening examinations to determine the relationship between varicocele and obesity.⁶ They also



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found that the prevalence and severity of varicocele were inversely correlated with obesity. In the April 2010 issue of the *Journal of the Chinese Medical Association*, Chen and Huang compared the differences in a variety of biochemical markers and BMI between 102 patients with varicocele and 95 control patients without varicocele. They also demonstrated that the BMI of patients with varicocele was significantly lower than those without varicocele.⁷

Why would BMI be related to varicocele? The results have been interpreted in several ways by the different authors. BMI is a measure of adiposity. In patients with higher BMI, it is plausible that there is a decreased nutcracker phenomenon or compression of the left vein due to increased adipose tissue between the superior mesenteric artery and aorta. Another possible explanation is decreased detection of varicocele in the overweight patient population due to difficulty in palpation on physical examination. The diagnosis of varicocele is somehow more difficult due to fat obliteration in obese patients. Therefore, Doppler ultrasonography is usually applied to confirm the diagnosis and reduce the number of false-negative patients in our clinical practice. The above-mentioned studies except Chen and Huang's were only based on physical examination, which indeed may lead to a decreased detection rate of varicocele in obese patients and influence the final relationship between varicocele and BMI. In Chen and Huang's study, the application of Doppler ultrasonography to confirm the diagnosis of varicocele would have markedly reduced the possibility of false-positive and false-negative patients. It is valuable and somewhat makes up for the shortcoming of small patient number when we compare the results with those of the 3 previous large-scale studies.

From the current epidemiological studies, including Chen and Huang's, a significant inverse relationship between BMI and the presence of varicocele seems to have been proven. While the authors acknowledge that decreased detection of varicocele in obese men may play a possible role in these differences, they mainly assert a hypothesis of the relief of the nutcracker phenomenon by adipose tissue to explain the relationship between BMI and varicocele. They postulate that increased fat around the left renal vein provides a cushion that protects against the nutcracker phenomenon. This concept is novel and provocative but needs further verification. To further elucidate the hypothesis, a longitudinal study comparing the change in grade of varicocele with BMI change in the same patient or measuring the visceral fat by computed tomography or magnetic resonance imaging must be conducted in the future.

In addition to exploring the relationship between varicocele and BMI, Chen and Huang also tried to find some useful biomarkers in their study. Unfortunately, they did not find any significant difference between the 2 groups except for cholesterol. I believe that all the serum biochemical markers they measured are of clinical insignificance except for testosterone level. In Chen and Huang's study, serum testosterone level was lower in the varicocele group and seemed to be related to varicocele grade. However, no statistically significant difference was noted in testosterone level between the 2 groups. In fact, a previous study has demonstrated lower testosterone levels in rats with varicocele,⁸ and varicocele repair restored the free testosterone level.⁹ The level of testosterone may reflect the degree of testicular damage by the varicocele itself. But the clinical application of testosterone as a marker is limited thus far.

In conclusion, similar findings have been published in other large-cohort studies,⁴⁻⁶ and Chen and Huang's study confirm the inverse relationship between varicocele prevalence and BMI in adult males. To my knowledge, theirs is the first study to use Doppler ultrasonography to minimize detection bias in obese patients. While all the authors put forward the hypothesis that fat around the left renal vein may provide a cushion that protects against the nutcracker phenomenon to explain their clinical findings, the hypothesis still needs further investigation.

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