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The mechanism of vacuum constriction devices in penile erection: the NO/cGMP signaling pathway?

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The traditional theories believe that vacuum constriction devices (VCD) is the mechanism through a suction chamber promoting penile blood engorgement and maintaining tumescence with a constriction band. For that mechanical nature of the device, many authors and patients consider the devices are passive engorgement, lack of spontaneous erections, and only rely on the constriction bands to prevent venous outflow to maintain the erection. However, recent clinical studies show that many patients using the VCD devices without the constriction band, but still maintain the erections and return to natural erections. The current theories cannot explain this phenomenon. We think that the VCD devices not only through the mechanical nature to prevent venous outflow by the constriction bands to maintain the erection, but also through the suction chamber to stretch and stimulate the corpora cavernosa nerves, muscles, and blood vessels, and led to the neurotransmitter nitric oxide (NO) released. NO as the principal messenger molecule through the NO/cGMP signaling pathway to mediate corporal smooth muscle relaxation and penile erection. The relaxation of corporal smooth muscle creates pressure in the tunica albuginea can prevent venous outflow and maintain erection. This can explain the phenomenon of many patients using the VCD devices without the constriction bands also maintain the erections and return to natural erections. Thus, we put forward the hypothesis that the classical NO/cGMP signaling pathway is also involved in the penile erections when using the VCD devices. In the future, we could design and apply rat-specific VCD devices without the constriction bands in rat model to analyze the cell and molecular changes in rat corpora cavernosa to test this hypothesis.

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