Effect of superior ovarian nerve and plexus nerve sympathetic denervation on ovarian-derived infertility provoked by estradiol exposure to rats

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Sympathetic innervation of the ovary in rodents occurs via two routes: the superior ovarian nerve (SON), which runs along the ovarian ligament, and the plexus nerve (PN), which is mainly associated with the vasculature. SON and ovarian norepinephrine (NE) levels play a major role in regulating ovarian cystic health. Although it was previously described that the polycystic ovarian phenotype (PCO) is causally related to hyperstimulation of the sympathetic nerves of the ovary, much less is known, however, regarding the role of PN in ovarian physiology. We studied the role of SON and PN in relation to the maintenance of the PCO phenotype induced in the rat by exposure to estradiol valerate (EV). EV exposure at 24 days old (juvenile exposure) increases NE in the ovary for up to 90 days after EV injection. SON or PN denervation (SONX and PNX) decreased NE. SONXreversed the acyclic condition from 30 days after surgery ($p < 0.05$), but PNXdid not. SONX was more effective than PNX to downregulate the increased number of cysts induced by EV, with the presence of the corpora lutea (CL, signifying ovulation) in the SONX group. Seventy percent of SONX rats presented with pregnancy at 60 days post-EV (6 of the 7 sperm-positive rats were pregnant); however, SONX rats had a reduced number (half) of pups compared with vehicle-treated rats and 60% more pups than EV rats. These data suggest that the SON plays a predominant role in follicular development, ovulation and pregnancy during ovarian diseases.