Study question
Pre-pubertal cancer boys for fertility preservation remains controversial due to unable sperm production for cryobanking. Dose the biocompatibility and biodegradability of three-dimensional scaffolds applied for immature testicular tissue engineering impact on the efficiency and efficacy of the transplanted immature murine testicular tissue in vivo for maintaining pre-pubertal male fertility preservation?

Summary answer
Biodegradable polylactic acid (PLLA), designed as nanofibrous membrane by electrosprining, was served as fine and coarse scaffolds. The regeneration of immature murine testicular grafts in fine scaffold was much better than the coarse one and fresh graft control without scaffolds which were tracked by in vivo bioluminescence imaging (BLI).

What is known already
As a pilot study, we demonstrated that significant better outcome of scaffold loaded immature murine testicular tissue than fresh grafts without scaffold in vivo at 2013 ASRM Annual Meeting. In our previous study (the first place prize poster for display), we have proved the way that the scaffold applied in immature murine testis was feasible and effective by in vivo optical imaging. The novelty is promising for interdisciplinary strategy fertility preservation of pre-pubertal cancer boys.

Study design, size, duration
4-week-old wild-type recipients were transplanted age-matched donor (FVB/N-tg (Polli-luc) Tg (IAP-β-HSD) Tg (II-luc) Ltc Iac-101-0090) testicular tissue to the castrated scrotum with fine, coarse scaffold (PLLA) (n=5) loaded and control without scaffold, followed by tracking by BLI in a longitudinal model to monitor transplanted grafts in vivo as long as 56 days.

Participants/materials, setting, methods
FVB/N-tg (Polli-luc) Tg (IAP-β-HSD) Tg (II-luc) Ltc Iac-101-0090 male mice were used as donors. Sexually immature inbred FVB/NJ/Narl wild-type mice were used as recipients. Before the experiment, the age-matched recipient mice underwent bilateral orchiectomy to leave scrotum as the grafted site. Bioluminescence imaging (BLI) was utilized to measure the testicular tissue development after transplantation.

Main results and the role of change
Based on the quantity of BLI analysis, the scaffold loaded immature testicular tissue demonstrated better survival than tissue on day 7 after transplantation. The fine scaffold used in testis tissue transplantation increased cell regeneration rendered the best outcome compared with the coarse scaffold and tissue alone especially on the 35 days after transplantation afterward. Therefore, polymer scaffolds are often modified with bioactive molecules or treated with extracellular matrix (ECM) proteins to improve cell attachment and nutrition extension to promote cell adhesion and improve cytocompatibility. PLLA provides better surfaces for promoting immature testicular engineering.

Limitations, reasons for caution
This study pilots the way to the interdisciplinary strategy by the utility of scaffolds and in vivo optical imaging by BLI as a tool to track the development of testicular grafts. The mechanism of the scaffold structure on testicular tissue regeneration needs to be clarified by future study.

Wider implications of the findings
Understanding the diversity of scaffold that mimics tissue subjects may support the testicular transplantation for pre-pubertal male fertility preservation. Due to their excellent shaping and molding properties, research interest in developing polyether nanofibrous based scaffolds may serve a new trend to study immature testicular tissue engineering by BLI to track the development of testicular grafts.