weeks postoperatively. *Results:* The patient underwent a soft tissue preserving multi-level bilateral L3 and L5 pars defect repair using the smiley face technique while utilizing radiation-free 3D optical imaging to capture multiple points for registration despite minimal laminar exposure. The patient's ODI and lower back VAS scores decreased from 25 to 8 and 7.5 to 4 respectively, after surgery, correlating to an excellent outcome on ODI. *Conclusions:* The smiley face technique can be used with soft tissue preserving techniques to achieve adequate bony reduction while maintaining intersegmental mobility in patients with multi-level pars defects. 3D imaging allows soft tissue preservation with increased registration points for intraoperative navigation.

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Evaluation of Poly Vinyl Alcohol Cryogel (PVA-C) composites for mimicking biomechanical properties of the lumbar interverterbral disc

BH Wang (London) K Gurr (London) C Bailey (London) G Campbell (London)*

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Background: Current lumbar intervertebral disc prostheses provide suboptimal symptom relief with little natural load-cushioning. PVA-C is a promising biocompatible material, and our previous study finds that it can closely mimic the properties of nucleus pulposus. However, pure PVA-C does not possess adequate stiffness to mimic the annulus fibrosus. *Methods:* Composite particle-reinforced PVA-C formulations were tested to identify methods that could increase the elastic modulus. This included: sephadex, hydroxyapatite (stock) and hydroxyapatite (in-solution synthesis). All formulations were tested using 15% PVA-C and 5% reinforcing agent. Indentation and durometer tests were performed as well as simple compression, compressive stress relaxation and creep. *Results:* Indentation and durometer results did not clearly reveal any specific formulations that significantly improved stiffness. The addition of in-solution synthesized hydroxyapatite resulted in 1.15 to 2 time increase in elastic modulus (0.3-0.9 MPa) and associated decrease in stress relaxation and creep. The addition of stock hydroxyapatite and spehadex (G100f and G50sf) lowered the elastic modulus and increased stress relaxation and creep. *Conclusions:* In-solution synthesized hydroxyapatite is the only particle-reinforced composite PVA-C formulation that exhibited greater stiffness than pure PVA-C. The elastic modulus will need to be increased by 5-10x to adequately mimic the annulus fibrosus. A fiber-reinforced composite will likely be needed to accomplish this.

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Tensile properties of Polyvinyl Alcohol Cryogel (PVA-C) formulations and generation of a tissue mimicking artificial lumbar intervertebral disc prototype

BH Wang (London) K Gurr (London) C Bailey (London) G Campbell (London)*

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Background: Current lumbar intervertebral disc prostheses provide suboptimal symptom relief with little natural load-cushioning. PVA-C is a promising biocompatible material, however previous studies from our lab show that it does not have adequate elastic modulus to mimic the annulus fibrosus. Here we present a prototype of an artificial lumbar intervertebral disc. *Methods:* The tensile properties of pure (5-35% PVA-C) and particle-reinforced (15% PVA-C with 5% of either Sephadex or hydroxyapatite) composite PVA-C formulations were evaluated. Simple tension and tensile stress relaxation tests were performed. Woven Teflon mesh was embedded in PVA-C and tested under compression. Endplate pull-out tests were performed. *Results:* Tensile testing showed that all PVA-C formulations behaved linearly for physiologic levels of strain (<20%). Tensile elastic modulus is an order of magnitude lower than the annulus fibrosus. Teflon has similar elastic modulus as collagen and compression of the hybrid Teflon-PVA-C construct revealed good biomechanical mimicry with elastic modulus of 20-25MPa at 20% deformation, similar to human data. Bonding between PVA-C and porous titanium endplate is excellent. *Conclusions:* A fiber-reinforced PVA-C impregnated composite adequately mimics the annulus fibrosus. Our prototype of a tissue mimicking artificial intervertebral disc utilizes a woven Teflon fiber with 20% PVA-C (+Hydroxyapatite) annulus and 5% pure PVA-C nucleus bonded to porous titanium foam endplates.

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Evaluation and surgical management of pelvic peripheral nerve sheath tumors: the University of Toronto experience and review of literature

S Wang (Toronto) Z Merali (Toronto) F Pirouzmand (Toronto)*

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Background: Pelvic peripheral nerve sheath tumors (PNST), which includes neurofibroma, schwannoma, and MPNST, are rare tumors located in the retroperitoneum. *Methods:* The case records of a prospectively maintained database at Sunnybrook Health Sciences Center (SHSC) were reviewed to identify patients with pelvic PNST, managed between 2006 - 2016. Medical records were retrospectively reviewed for patient demographics, presentation, tumor location, symptoms, imaging characteristics, management, and outcome. The surgical technical caveats were described. An English language literature review was performed to describe previously published experiences. *Results:* The series consisted of 7 patients, ranging from 22 - 74 years of age at presentation. These lesions tend to be large at the time of diagnosis, and presenting symptoms include abdominal, flank, or back pain, as well as leg edema or hydronephrosis from local compression. Most patients in this cohort were managed surgically with midline abdominal transperitoneal exposures. Lastly, 5 tumors were benign schwannomas managed with gross total resection or debulking, while 2 patients had MPNSTs managed with biopsy followed by adjuvant chemoradiation therapy. *Conclusions:* In this case series, we describe the characteristics, evaluation, and management of 7 patients with pelvic PNST at a major healthcare institution in Toronto, Canada, highlighting the technical aspects of managing this rare and challenging entity.