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# Intra-Operative Topical Vancomycin Powder Application-Is the Practise Safe in Paediatric Spine Surgeries?

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concentrations. Recently, Rindone *et al.* developed a biomimetic PDGF delivery system using heparin-conjugated, decellularized bone particles (HC-DCB) that enhances ADSC-mediated bone regeneration in critical-sized murine calvarial defects. In this study, we utilized this promising delivery system for the controlled release of PDGF-BB in 3D-printed PCL-DCB spinal fusion grafts in a rat model. **Materials and Methods:** ADSCs were isolated from the inguinal fat pads of syngeneic 6-8-week-old Lewis rats and cultured *in vitro*. When passage 1 (P1) ADSCs reached 80% confluency, cultured-expanded ADSCs (P2) were seeded onto PCL-DCB scaffolds along with HC-DCB particles (40 mg/mL in fibrin) and 20 µg/mL PDGF for subsequent transplantation. Dorsolateral spinal fusion surgery at L4-L5 was performed on Lewis rats divided into 5 experimental groups: [1] PCL only; [2] PCL-DCB + HC-DCB particles; [3] PCL-DCB + HC-DCB particles + PDGF; [4] PCL-DCB + HC-DCB particles +  $2.5 \times 10^6$  ADSCP2/side; and, [5] PCL-DCB + HC-DCB particles +  $2.5 \times 10^6$  ADSCP2/side + PDGF. Fusion was evaluated eight weeks post-surgery. Micro-computed tomography (microCT) images were evaluated to determine CT fusion status and fusion mass volume. Histology and immunohistochemistry were performed to assess new bone quality. **Results:** MicroCT imaging analyses revealed bone formation along the scaffolds struts for all PCL-DCB groups. Additionally, all PCL-DCB groups created fusion masses between the L4-L5 transverse processes (TPs). By contrast, [1] PCL only scaffolds did not form bone. Of all the PCL-DCB groups, the [3] PCL-DCB + HC-DCB particles + PDGF group significantly displayed a higher CT volume ( $P < .05$ ). Furthermore, histological staining demonstrated that PCL-DCB grafts were well-integrated with the host TPs in all groups. A more significant bone deposition was found in the graft-TP interface in the treated groups ([3], [4], and [5]) compared to [2] PCL-DCB + HC-DCB particles, being more remarkable in the [3] PCL-DCB + HC-DCB particles + PDGF group. Expression of Runx2, osteocalcin, and CD31 was observed in the treated groups ([3], [4], and [5]). **Conclusions:** We demonstrated that biodegradable PCL-DCB grafts enable spinal fusion when combined with osteoinductive HC-DCB particles. Although the presence of both cells and growth factors was not required to achieve spinal fusion in PCL-DCB + HC-DCB grafts, PDGF-BB enhanced bone formation when added to these grafts.

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### **A215: Validity of Scoliotic Discs as Controls for Molecular Research in Intervertebral Disc Disorders**

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**Introduction:** Despite being a highly researched subject, the studies on etio-pathogenesis have been inconclusive. One of the primary reasons for elusiveness being, lack of appropriate controls for making a precise comparison with degenerated discs. Discs from scoliosis surgery is a common control used in molecular studies of disc disorders. This study aims to compare the validity of scoliotic discs as controls by comparing it against MRI normal discs from voluntary organ donors and establish 'True Controls' that can be utilized for future Intervertebral disc (IVD) research. **Materials and Methods:** After appropriate ethical clearance and consent, nucleus pulposus of Eight MRI normal discs from eight brain dead voluntary organ donors (ND) and eight scoliotic discs (SD) from three patients who underwent anterior surgery for adolescent idiopathic scoliosis were harvested under sterile precautions. After protein extraction, pre-fractionation and in-gel tryptic digestion, the extracted peptides were subjected to tandem mass spectrometry. The raw data were subjected to further bioinformatic analysis to understand the patho-mechanisms involved. **Results:** Mass spectrometry identified a total of 235 proteins in ND and 438 proteins in the SD group and 157 proteins common to both groups. About 78 (15.31%) proteins were found only in the ND group, and 281 (54.45%) were found only in the SD group. Proteins involved in Extracellular matrix integrity (Versican, Keratins KRT6A, KRT14, KRT5 and KRT 13A1, A-kinase anchor protein 13, Coagulation factor XIII A chain, Proteoglycan 4) and proteins involved in transcription and DNA repair (Von Willebrand factor A domain-containing 3B, Eukaryotic initiation factor 2B, Histone H4, Leukocyte Cell-Derived Chemotaxin 2) were found to be down-regulated in SD. Inflammatory proteins (C3, C1S), and oxidative stress response proteins (Peroxiredoxin-2,6, Catalase, Myeloperoxidase, Apolipoprotein E) were found to be up-regulated in SD. These changes were reflected at the pathway level also. **Conclusion:** Our study found that scoliotic discs have an abundance of inflammatory, oxidative stress response proteins. Whereas, these proteins were either absent or downregulated in the MRI normal discs from voluntary organ indicating a more biologically inert state. These findings establish MRI normal discs from voluntary organ donors as the 'true' control for molecular studies in IVD research and recommend it for future studies.

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### **A216: Intra-Operative Topical Vancomycin Powder Application-Is the Practise Safe in Paediatric Spine Surgeries?**

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**Introduction:** Various methods have been developed and implemented to prevent SSI in the paediatric population. The practices vary among different groups of surgeons based on their training and expertise. One such practice is the application of Topical Vancomycin Powder (TVP) in the surgical wound before closure. Vancomycin powder is increasingly used off-label as TVP to prevent infection in spine surgeries. Uncertainty exists on its safety and usefulness in pediatric population. Hence, we aim to systematically review the available articles on TVP use in pediatric spine surgeries exploring the usefulness and safety of such practice. **Materials and Methods:** We conducted independent and duplicate electronic database search in PubMed, Embase and Cochrane Library till March 2020 to identify all relevant literature on the use of TVP for pediatric spine surgeries. Surgical Site Infection (SSI) rate, specific reported complications, reoperation rate, microbial flora pattern in reported SSI and safety profile were the outcomes analyzed. Analysis was performed in R platform using OpenMeta [Analyst] software. **Results:** No prospective studies were available to evaluate the use of TVP in pediatric spine surgeries for the prevention of SSIs. Neither standardized protocol nor drug dosage or safety profile was established for pediatric use. Three retrospective cohort studies including 824 patients (TVP/Control = 400/424) were included in the meta-analysis. There was a low-quality evidence suggesting no significant difference between the two groups in SSI rate (RR = .474, 95% CI [0.106, 2.112],  $P = .327$ ) with significant heterogeneity ( $I^2 = 70.14$ ,  $P = .035$ ). TVP group showed a significant benefit on cost-analysis in one of the included studies. However, TVP did not prevent gram-negative co-infection on SSI in the TVP group. **Conclusion:** TVP does not qualify to be recommended as a safe and useful option to prevent SSI following pediatric spine surgeries from the literature available at present. High-quality prospective interventional studies are needed to arrive at a consensus on its use along with appropriate dosage and method of application.

## OP25: Lumbar Degeneration

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### A217: Lessing PROM Burdens Via Machine Learning

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**Introduction:** Clearly and concisely understanding patient conditions is a universal goal of physicians. Patient Reported Outcomes Measures (PROMs) are employed as tools to scientifically gain this insight as efficiently as possible in order to optimize medical consultations. While PROMs alone are generally not burdensome, they are often administered directly following a substantial amount of other registration, past medical and history of present illness paperwork. Attempts to improve the situation have been made by administering shorter PROM forms. Computer Adaptive Testing (CAT) is a strategy that dynamically selects the most appropriate next question based on previous response and in turn, reduces the amount of questions required to complete the form session. Unnecessary questions are omitted based on the patient's unique current condition and a valid score is still effectively assigned via this more concentrated technique. Examples of CAT include PROMIS and PediCat instruments, both of which rely on Item Response Theory (IRT). Recent publications have validated a machine learning (ML) method which voids the need for calibrated item banks and permits CAT application to historically popular PROM instruments. Our aim is to expand on such ML approaches to further explore question reduction. **Material and Methods:** ML CAT methods have yielded up to fifty-percent savings in questions, while having a correlation coefficient  $>.98$  with the full questionnaire. The algorithms sought maximum accuracy, and question reduction occurred as a collateral benefit. This work may be extended by focusing on lowering question count to the absolute extent possible while still maintaining score integrity for the Neck Disability Index (NDI) and Oswestry Disability Index (ODI) instruments. Data analysts examined the ML algorithm and CAT results for NDI and ODI, honing in on questions revealed to be less significant for score accuracy. The ML CAT model was adjusted based on new findings and reapplied to the data set. The resulting system, in view of its increased speed of use, is informally called CAT+ or *Cheetah*. **Results:** The full form NDI asks 10 questions. The NDI (ML) CAT managed to obtain a correlation coefficient  $>.97$  with an average of 5.92 questions per session. The NDI Cheetah obtained a correlation coefficient  $>.96$  with an average of 4.97 questions per session. See Table 1 for statistical details. The full form ODI asks 10 questions. The ODI (ML) CAT averaged 5.53 questions per session with a correlation coefficient  $>.98$ . The ODI Cheetah averaged 4.36 questions per session with a correlation coefficient  $>.96$ . See Table 2 for statistical details. **Conclusion:** The CAT method verified for a number of legacy PROMs shows consistent findings when applied to NDI and ODI instruments. Still, our research demonstrates that previously used ML methods ask questions that produce minimal gains in terms