

Electronic Poster Presentations

P01

Health-related Quality of Life of Patients with Lenke 1 and 2 Severe Adolescent Idiopathic Scoliosis 2 Years after Surgery

WW Chau, BKW Ng, ALH Hung

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Surgical treatment of patients with of Lenke 1 (main thoracic) and Lenke 2 (double thoracic) severe adolescent idiopathic scoliosis (AIS) is well reported. However, few reports have discussed the quality of life of this group of patients. Structural changes after surgery leading to change in quality of life in these two groups of patients have yet to be discussed.

Methods: In total, 26 patients with Lenke 1 (n=9) and Lenke 2 (n=17) severe AIS who underwent posterior spinal fusion between 2016 and 2017 were recruited; 42.3% of patients were followed up for at least 2 years. All recruited patients completed the Scoliosis Research Society Outcomes Questionnaire (SRS-22) online before surgery (pre-op), immediately after surgery (post-op), and up to 3 times during the follow-up period (2 years post-op).

Results: Major thoracic curve was corrected by 71.9% after surgery. "Appearance" in Lenke 2 patients was much improved over the 2 years after surgery (mean scores: pre-op=3.17, post-op=3.92, 2 years post-op=4.60; $p<0.01$). Likewise, Function/Activity scores in Lenke 2 patients showed function was gradually returned after nearly 2 years post-op (mean scores: pre-op=4.49, post-op=3.47, 2 years post-op=4.60; $p<0.01$). Similar observation was also found in Lenke 1 patients (pre-op=4.74, post-op=3.00, 2 years post-op=4.80; $p=0.01$).

Conclusion: From the patients' prospective, body functions in both Lenke 1 and 2 patients are retained around 2 years of surgery. This is important for them to have enough power to carry out daily activities. Appearance in Lenke 2 patients were greatly accepted which shows profound advantages in self-esteem and thus social activities.

P02

Health-related Quality of Life of Adolescent Idiopathic Scoliosis Patients 30 Years after Surgery

WW Chau, BKW Ng, ALH Hung

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Our centre has provided surgical treatment service for scoliosis for over 30 years, so it has been 30 years since some patients with adolescent idiopathic scoliosis (AIS) underwent surgery. Long-term follow-up of the quality of life of these patients has not been reported elsewhere. We speculate that definitive changes may occur many years after surgery.

Methods: Patients with AIS who previously underwent surgery at our centre were invited to complete the Scoliosis Research Society Outcomes Questionnaire (SRS-22) through a custom-designed online system from a mobile device. Number of years since surgery per questionnaire were grouped per 1 year until the 10th year, and per 5 years thereafter. Function, pain, self-image, mental health, satisfaction with management, and mean scores per time interval were compared.

Results: In total, 1315 patients completed 2445 the SRS-22 from November 2016 to June 2019. Comparing with results from less than 1 year after surgery, results showed function was significantly increased within the first 2 years, decreased during year 3, recovered at year 4, and gradually increased and remained stable until year 30. Pain was lowest at year 3 after surgery and was stable thereafter. Self-image decreased during years 10 to 15 and 20 to 25, and otherwise remained stable. Mental health, satisfaction, and mean scores remained stable over the entire study period.

Conclusion: This is the first long-term study of the quality of life of patients with AIS up to 30 years after surgery. Patients experienced promising quality of life many years after surgery. Continuous monitoring and support are recommended for patients towards as they approach age 40 to 50 years (perimenopause).

P03

Juxta-articular Myxoma at Elbow — a Rare Mimicker of Ganglion Cyst: A Case Report and Literature Review

H Pang,¹ RKL Lee,² APH Chan³

¹*Department of Orthopaedics and Traumatology, Prince of Wales Hospital, Hong Kong*

²*iRad Medical Diagnostic Centre, Hong Kong*

³*New Medical Center, Hong Kong*

Juxta-articular myxoma (JAM) is a rare, benign yet recurrent-prone soft tissue tumour. Our team describe the first locally reported case of JAM, which mimics ganglion cyst clinically. A middle-aged man presented to our clinic with a slow-growing left elbow mass, associated with symptoms compatible with lateral epicondylitis (tennis elbow). For a juxta-articular cystic mass, a common practice would be simple investigation such as X-ray, followed by complete surgical excision with the provisional diagnosis of ganglionic cyst. Here we present a case of JAM to raise awareness on further investigation before simple excision is performed, especially when further imaging such as magnetic resonance imaging or ultrasound scan is readily available nowadays. In addition, clinicians should be reminded that the differentiation of JAM from a simple ganglion is essential, as myxoma is known to have high local recurrence, hence warrant more clinical attention.

P04

Three-dimensional Printed Cobalt-chromium Porous Metal Implants Showed Enhanced Bone-Implant Interface and Bone In-growth in a Rabbit Epiphyseal Bone Defect Model

SKH Chow,¹ SY Mak,² MMC Li,¹ BCH Yung,² EWF Yau,² CS Chui¹

¹*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong*

²*Koln 3D Technology (Medical) Limited, Hong Kong*

Introduction: Cobalt-chromium (CoCr) alloy has advantages over titanium implants in high hardness, wear-resistance, and biocompatibility without the risk of bone growth on the articulating surfaces, ideal for joint prostheses. Additive manufacturing (three-dimensional [3D] printing) to incorporate porous lattice structures in CoCr implants to enhance bone-implant interface is rarely reported and therefore investigated in this study.

Methods: Female 16-week-old rabbits were randomly divided into three groups: control (porosity=0), group A (porosity=0.25), and group B (porosity=0.55) at n=3 per group. A 5-mm defect was drilled on the patellofemoral groove and 3D-printed CoCr implants were implanted. Ex vivo radiography and non-decalcified histology were performed at end-point of week 8. Bone-implant interface and bone in-growth were evaluated by histomorphometry. Analysis of variance was used to detect difference between groups with post-hoc Bonferroni test considered at p<0.05.

Results: Bone in-growth were observed in small and large lattice unit group and both with higher bone-implant interface at $918.5 \pm 40.3 \mu\text{m}$ and $590.5 \pm 105.4 \mu\text{m}$, respectively versus the control group at $218 \pm 4.2 \mu\text{m}$. Histomorphometry evaluation also showed that group A and B had 1.9-times and 5.2-times higher osteoid area fraction, respectively, compared with the control group.

Conclusion: Larger lattice units with larger porosity allowed more cavities for osteoid and bone formation in the CoCr implants as demonstrated by enhanced bone-implant interface and osteo-integration versus a solid implant. This study proves the concept and applicability of 3D-printed porous structure in CoCr implant to achieve better bone and implant integration.

P05

Double Osteotomy as a Treatment for Knee Osteoarthritis in Patients with Poliomyelitis: Two Case Reports

WH Lam, CY Tam, SYC Wan, YW Hung, TTS Tse, CH Fan

Department of Orthopaedics and Traumatology, Alice Ho Miu Ling Nethersole Hospital, Hong Kong

Poliomyelitis is characterised by loss of motor neurons resulting in flaccid paralysis, generalised hypotonia, and abnormal alignment, predisposing the patient to limb and joint deformities and gait problems starting at a young age. With time, painful osteoarthritis can occur. Although total knee replacement in patients with poliomyelitis may provide good functional outcome, it is associated with a higher revision and complication rate compared with that in patients without poliomyelitis. Osteotomies are a viable solution for knee osteoarthritis in patients without poliomyelitis; however, to the best of our knowledge, there is no literature available on osteotomy for patients with poliomyelitis having knee osteoarthritis. This is a report of two cases of patients with poliomyelitis having knee osteoarthritis who were treated successfully with tibial and femoral osteotomy with good functional outcome. The first case was a 66-year-old man with history of left lower limb poliomyelitis had painful medial compartment osteoarthritis of his left knee and a pre-existing flexion contracture and varus deformity. The second case was a 61-year-old woman with right lower limb poliomyelitis who had a painful lateral compartment osteoarthritis of her right knee with genu recurvatum and valgus deformity. Double osteotomies in femur and tibia were performed in both patients. Mechanical alignment was restored, and functional improvement was observed in both patients. With proper patient selection, osteotomy is a feasible surgical treatment and good alternative to knee arthroplasty for patients with poliomyelitis having osteoarthritis.

P06

Low-magnitude High-frequency Vibration Treatment Attenuates Age-related Neuromuscular Junction Degeneration

ZY Bao, C Cui, SKH Chow, L Qin, WH Cheung

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Sarcopenia is defined as age-related decline in muscle mass and strength. There are multiple aetiological factors leading to sarcopenia, and neuromuscular junction (NMJ) degeneration is one of the causes. According to our previous studies, systemic low-magnitude high-frequency vibration (LMHFV) treatment could improve skeletal muscle function in sarcopenia, but the detailed mechanisms are still unclear. This study aimed to investigate the effects of LMHFV on NMJ degeneration in sarcopenia.

Methods: A total of 54 male SAMP8 mice aged 6 months were randomised into either control or vibration (VIB) groups. The mice in the VIB group were treated with LMHFV (35 Hz, 0.3 ×g) 20 minutes/day and 5 days/week. Neuromuscular junction ex vivo function and structure were evaluated at months 0, 2, 3, 4 and 6 post-treatment with n=6/group/time point. Student's t test was used for analysis with p<0.05 considered significant.

Results: In NMJ ex vivo function test, specific tetanic force in VIB group increased by 15% compared with control group at month 3 post-treatment. Morphologically, immunofluorescence results showed that discontinuity index of NMJ postsynaptic acetylcholine receptors in control group was higher than that in VIB group at month 4 post-treatment (10 in control vs 7.8 in VIB).

Conclusion: Low-magnitude high-frequency vibration was previously shown to enhance muscle function in sarcopenic mice. Our updated results revealed that LMHFV treatment could achieve the muscle enhancement through improving NMJ function and attenuate morphological degeneration of the NMJ in sarcopenic animal model during ageing.

P07

Cyclic Mechanical Loading Enhances Osteoporotic Fracture Healing: The Role of Dentin Matrix Protein 1

MMC Li, SKH Chow, RMY Wong, WH Cheung

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Osteoporotic fracture is common in elderly people and is well-known to have impaired healing capacity. Low-magnitude high-frequency vibration (LMHFV) can significantly accelerate osteoporotic fracture healing through alteration of osteocyte lacuno-canalicular network (LCN). Dentin matrix protein 1 (DMP1) is abundant in osteocytes and responsible for maintaining LCN and mineralisation. This study aimed to investigate osteocyte-specific DMP1's role in mechanosensing and fracture healing.

Methods: Six-month-old female Sprague-Dawley rats underwent bilateral ovariectomy to induce osteoporosis. Metaphyseal fracture was created at right distal femur using oscillating micro-saw. Rats were randomised to groups: (1) DMP1 knockdown done by injection of shRNA into marrow cavity 2 weeks before surgery (DMP1 KD), (2) DMP1 KD + vibration, (3) scramble + vibration, or (4) vehicle control + vibration. Assessments included weekly X-ray, micro-computed tomography, dynamic histomorphometry, and immunohistochemistry on DMP1, sclerostin, and E11.

Results: Dentin matrix protein 1 KD significantly impaired fracture healing compared with the vehicle control group. Dynamic histomorphometry showed that the vehicle control + vibration group had highest mineral apposition rate among 4 groups ($8.24 \pm 0.287 \mu\text{m}/\text{day}$) at week 6. DMP1 KD and KD + vibration groups had lower mineralisation rate of $7.19 \pm 0.647 \mu\text{m}/\text{day}$ and $7.42 \pm 0.681 \mu\text{m}/\text{day}$, respectively.

Conclusion: The lower mineralisation rate in DMP1 KD groups indicated that knockdown of DMP1 was associated with poorer fracture healing process compared with control group. The difference between the DMP1 KD group and the DMP1 KD + vibration group was not significant, showing that blockage of DMP1 would negate LMHFV-induced enhancement on fracture healing.

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P08

Effectiveness of a Secondary Osteoporotic Vertebral Fragility Fracture Prevention Pathway after 3 Years

SY Ko, WW Chau, SW Law

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Osteoporotic vertebral fragility fractures are common and associated with significant morbidity and mortality, but remain underdiagnosed and undertreated. The osteoporotic vertebral fragility fracture prevention pathway (OVFP) model and preliminary findings were first reported 3 years ago. It is time to evaluate the service.

Methods: All patients underwent prospective follow-up examinations after vertebral fragility fracture treatment at baseline and subsequently at 6, 12, 18 and 24 months. Descriptive analysis and comparisons were made between participants enrolled before and after the implementation of the OVFP model.

Results: A total of 304 participants were recruited. In all, 73% of the patients were recruited from the outpatient department and 27% from the inpatients. The mean T-score at the spine was -2.4 ± 1.5 at baseline and -1.73 ± 1.76 at 24 months ($n=51$), and the mean T-score at the hip was -1.94 ± 1.20 at baseline and -1.52 ± 1.32 at 24 months ($n=51$). The mean Roland-Morris Disability Questionnaire score improved from 10.38 ± 7.34 to 7.44 ± 5.20 . All patients received calcium/vitamin D and/or osteoporosis medication at discharge and fall prevention education from the nurses. Only two (1.2%) out of 166 patients (who completed 1-year follow-up) had a second fracture by 1-year follow-up examination.

Conclusion: The OVFP model is effective to lower the risk of subsequent fractures, prevent re-admission, and maintain functional capacity.

P09**Non-union of Medial Clavicle Fracture: A Case Report and Literature Review****YM Tse, ST Ho***Department of Orthopaedics and Traumatology, Caritas Medical Centre, Hong Kong*

Fracture of medial clavicle is rare; non-union of medial clavicle fracture is even rarer. Here, we report such a case. A 55-year-old woman was injured by a falling brick over right head and right upper chest. She was conscious with stable vital signs and no neurological deficit. Plain X-ray showed displaced fracture of the medial clavicle and right 2nd and 3rd ribs. Computed tomography of the brain was normal except for scalp haematoma. The medial clavicle fracture was treated conservatively. Later, she presented with pain and skin impingement from a fracture fragment. Computed tomography scan showed grossly displaced clavicle fracture with minimal callus formation at 2 months after injury. Exploration at 3 months after injury revealed a long oblique fracture in the coronal plane with the lateral clavicle fragment displaced anteriorly and medially with shortening of 2.5 cm. The fracture was fixed with two lag screws supplemented by neutralisation plate on superior surface of the clavicle. The non-union healed uneventfully. By 4 months after the operation, the right shoulder motion was full, and the patient could achieve medium to heavy level of functional capacity in Functional Capacity Evaluation. Because of the rarity of medial clavicle fracture and particularly the non-union, a variety of fixation methods has been described. In this patient, we used an inverted distal clavicle locking plate on the superior surface of the clavicle. The choice of plate and placement of the plate fixation will be discussed, with special reference to the anatomy and major blood vessels in the close proximity to the medial third clavicle.

P10**Acromioclavicular Joint Dislocation Associated with Coracoid Process Fracture: A Case Report****YM Tse, HHS Chan, ST Ho***Department of Orthopaedics and Traumatology, Caritas Medical Centre, Hong Kong*

Acromioclavicular (AC) joint dislocation is common following shoulder injury. Concomitant coracoid process fracture is a rare association. Here we report such a case. A 55-year-old woman fell from a chair and landed on her left shoulder. She sustained left AC joint dislocation and suspected coracoid process fracture, which was confirmed with computed tomography scan. Exploration showed fracture of base of coracoid process extending along the upper border of scapular body with glenoid involvement. The coracoclavicular ligaments were intact. After fixation of coracoid process fracture with a 4.5-mm cannulated screw, the AC joint was reduced and stable on stress view. The coracoid process fracture healed, and the AC joint remained reduced. The patient regained an excellent shoulder range of motion. There was mild pain at end range of motion, and she returned to work by 5 months. In the combined injury, coracoid process may be overlooked when the attention is directed towards the more obvious AC joint dislocation. Screw fixation of coracoid process fracture can simultaneously reduce both the displaced coracoid process fracture and AC joint dislocation via the intact coracoclavicular ligaments. This help to avoid AC joint fixation and the associated complications and removal of hardware (hook plate or transacromial pin).

P11

Disassembly of Bipolar Head of Hemiarthroplasty of the Hip Causing Notching of Neck of Femoral Stem: A Case Report

TC Chau, KY Chung, CY Tso, N Tang

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, Hong Kong

Hemiarthroplasty of the hip is an established treatment for femoral neck fractures. Although implant development has influenced fracture treatment, unique complications related to surgical implants have been reported. We present a case of spontaneous dissociation of bipolar head of hemiarthroplasty of the hip in a 73-year-old woman. She had fracture of right femoral neck after a fall 5 years prior to presentation. A cementless hemiarthroplasty of the right hip had been performed at that time. She complained of increasing pain over the right hip 5 years after the index surgery without any trauma, when X-ray showed bipolar head disassembled from the femoral head. During the revision surgery, notching of the inferior part of neck of femoral stem by the bipolar head was noted. The femoral stem was well fixed. Revision to total hip arthroplasty was performed with femoral stem retained. Latest follow-up 2 years postoperatively showed stable construct with no progression of femoral stem notching and no implant failure. We discuss the current known literature about the topic of bipolar hip implant cup dissociation regarding the pattern, risk factors, as well as salvage options. Although rare, surgeons should be aware of the possible complications related to surgical implants, and formulate treatment plan that is individualised the patient, and dedicated to the uniqueness of the implant.

P12

p63 as a Biomarker for Diagnosis of Giant Cell Tumour of Bone: A Systematic Review and Meta-analysis

ZH Wan, C Lau, CW Lee, SM Kumta, OKS Lee

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: p63 has been identified to be highly expressed in giant cell tumour of bone (GCTB), however, there is controversy about the usefulness of p63 as a diagnostic marker for the disease. We evaluated the accuracy and clinical value of p63 for the diagnosis of GCTB.

Methods: We searched PubMed, EMBASE, and the Cochrane Library, from inception to 30 April 2019. We included only articles written in English that investigated the diagnostic value of p63 for differentiation of GCTB. Animal experiments, reviews, correspondences, case reports, expert opinions, and editorials were all excluded. studies had to provide sufficient information to construct the 2×2 contingency table. We calculated individual and pooled sensitivities and specificities. We used I² to test heterogeneity and investigated the source of heterogeneity by meta-regression.

Results: A total of 88 records were identified by our search, of which nine fulfilled the inclusion criteria, accounting for 875 patients. The bivariate analysis yielded a mean sensitivity of 0.87 (95% confidence interval [CI]=0.74-0.94) and specificity of 0.70 (95% CI=0.57-0.61). The area under the receiver operating characteristic curve was 0.85 (95% CI=0.82-0.88). The studies had substantial heterogeneity (I²>75% and p<0.1). None of the subgroups investigated (population, admission category, and gender) could account for the heterogeneity.

Conclusion: p63 is a helpful biomarker for the diagnosis of GCTB. Nevertheless, the results should be carefully interpreted combined with the other information from physical examination, medical history, and histological assessment.

P13

Algorithm and Tips for Management of Vascular Injury in Total Knee Replacement: A Retrospective Case Study

CY Tam, LCM Lau, YC Cheung, SYC Wan, YW Hung, JCH Fan

Department of Orthopaedics and Traumatology, Alice Ho Miu Ling Nethersole Hospital, Hong Kong

Introduction: Total knee replacement (TKR) is one of the most common and successful joint replacement operations. However, complications of TKR may compromise the clinical outcome. Among various complications, vascular injury is recognised as rare but devastating. Incidence of vascular injury in our centre was 0.09% from 2000 to 2019. Early recognition and quick action are essential once injury occurs.

Methods: A retrospective case study with data of TKR operations in our centre from 2000 to 2019 was conducted. All cases undergoing TKR in the period were evaluated and cases of subsequent vascular injury were highlighted. Preoperative assessment, radiological investigations, physical examination, intra-operative findings, and follow-up of the highlighted cases were reviewed and analysed. An algorithm was drafted for managing suspected vascular injury based on our experience and data.

Results: Two out of 2166 TKR operations from 2000 to 2019 were identified to have vascular injury in our centre (incidence 0.09%). Both patients were men, aged 61 and 74 years. One was injured during revision surgery whereas the other during index operation. Repair was carried out in both cases with regular follow-up examinations. Both patients had limb salvage with residual deficit.

Conclusion: Vascular injury is rare but devastating, we have to remain vigilance in detecting its signs and symptoms. Once vascular injury is suspicious, following pre-designed algorithm would allow prompt management and facilitate coordination with different teams. From our experience, limb is salvageable following vascular injury in TKR whereas prevention and prompt treatment are the cornerstone to prevent long-term functional deficit.

P14

Iliotibial Band Impingement Following Total Knee Replacement: A Case Series

MKL Li, CK Wong, YW Hung, SYC Wan, TTS Tse, JCH Fan

Department of Orthopaedics and Traumatology, Alice Ho Miu Ling Nethersole Hospital, Hong Kong

Although total knee replacement is often considered the definitive treatment option for patients with knee osteoarthritis, it has been reported that 20% of patients encounter persistent knee pain after surgery. Soft tissue impingement constitutes a notable bracket of postoperative pain generators, owing to the diagnostic challenge it may pose, and the prospect of averting a revision procedure if the phenomenon is identified in a timely manner. Despite the ongoing evolution and refinement of total knee implants, including the advent of mobile bearing total knee implants that have been marketed to allow more precise approximation of normal knee kinematics and enhance patella tracking, development of postoperative soft tissue impingement remains pertinent. We report two consecutive cases of iliotibial band impingement following total knee replacement at our centre from 2015 to 2017. Iliotibial band impingement in the former implant was postulated to be attributable to an overhanging tibial tray in a fixed bearing implant, and the latter to an overhanging rotating polyethylene insert in a mobile bearing implant. Both demonstrated a valgus postoperative tibiofemoral angle. Prompt treatment via arthroscopic release in both cases circumvented traumatic and costly revision procedures.

P15

Injectable Gelatin Methacryloyl Hydrogel as Drug Carriers to Locally Apply Abaloparatide in Promoting Bone Defect Regeneration

ZY Ning,¹ BY Tan,¹ B Chen,¹ ADS Lau,¹ TM Wong,² WWJ Lu¹

¹*Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong*

²*Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong*

Objectives: We developed injectable gelatin methacryloyl (GelMA) hydrogel as drug carriers to prolong the release of abaloparatide in vitro and promote bone regeneration in a bone defect in vivo model.

Methods: The synthesis of GelMA was achieved by reacting the amino groups of lysine on gelatine with MA. The morphology of GelMA hydrogel was assessed by scanning electron microscopy. The release of abaloparatide in GelMA hydrogel in vitro was examined by high-performance liquid chromatography. Male 11-week-old Sprague-Dawley rats were selected as animal models, and the bone defect site was on the lateral epicondyle of left femur bone. Animals of experimental groups were treated with either pure GelMA or abaloparatide-loaded GelMA injected onto the defected site, but no treatment was given to the control group. Micro-computed tomography scan was conducted 1 month after surgery. The trabecular bone volume fraction, bone mineral density, trabecular number, and trabecular thickness were calculated using CTAn software.

Results: The scanning electron microscopy images showed the porous structure of the GelMA hydrogel and the release of abaloparatide could last for 12 days. The abaloparatide-loaded GelMA group showed significantly higher bone regeneration rate when compared with the control group, whereas the GelMA group also showed a rise of new bone regeneration rate but not significantly when compared to the control group at 4 weeks after surgery.

Conclusions: Injection of abaloparatide-loaded GelMA hydrogel is an effective treatment in bone defect by promoting bone regeneration.

P16

Application of Three-dimensional Printing in a Local Joint Replacement Centre

BWC Luk, BYH Tang, HF Tsui, HL Wong

Department of Orthopaedics and Traumatology, Tuen Mun Hospital, Hong Kong

Three-dimensional (3D) printing is becoming popular in the medical field and we have applied this technology in joint replacement surgeries. We would like to review the logistics, application, and tricks of 3D printing in our centre. The uses of 3D printing in our centre can be classified into four categories: (1) better preoperative preparation for complex cases as trial reaming and implant sizing could be done on 3D model; (2) better appreciation of postoperative component alignment on a 3D model instead of just computed tomography (CT) images; (3) patient-specific instrument for joint replacement, and (4) making of patient education model if it is not available on the market. The 3D models/instruments could be made from computed tomography (CT) or magnetic resonance imaging images. They could be provided by medical equipment companies, universities or made by ourselves. To create 3D models by ourselves, we need to obtain DICOM data from patient's CT images and use 3D software to isolate the anatomical part of interest for generation of 3D model for printing (this step is made complicated by the presence of metal artefact if there is metal implant in situ). The quality and duration of printing are affected by multiple factors, including the orientation and resolution of printing, and the size of the model.

P17

Medical-social Collaboration for Management of Work-related Low Back Pain**SY Ko, WW Chau, SW Law***Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong*

Introduction: Work-injured workers face many challenges such as physical disability, emotional distress, or financial troubles. The Multi-disciplinary Orthopaedics Rehabilitation Empowerment (MORE) programme for injury-on-duty patients is well established. Some patients without case managers from insurance companies have been seen at the Orthopaedic Ambulatory Care Centre (OACC) since 2015 under the Medical-Social Interface approach in which clinicians and social workers collaborate to provide a comprehensive care model for target groups. This study gives an overview of the approach after providing 2 years of services.

Methods: A total of 59 patients with work-related low back pain on sick leave were recruited from the specialist outpatient clinic waiting list between year 2015 and 2017. The non-profit organisation or worker association was invited to provide social support and consultation for patients per clinic session. Patients with work-related low back pain who received consultations in specialist outpatient clinic, but did not receive any services from OACC and the non-profit organisation were classified as control group.

Results: Total number of sick leave days issued by the Hospital Authority was 262, compared to 507 in the control group. Roland Morris Disability Questionnaire mean score decreased from 16.09 (baseline) to 11.82 (at 12 months) [n=59, p<0.01]. All patients from study group received the information on handling procedures of work injury. In all, 74.6% and 60.3% of them received psychological support and consultation on legal issues, respectively. In total, 42.9% of patients from study group were offered employment counselling and job training courses.

Conclusion: Medical-Social interface model in work rehabilitation is feasible and an effective integrated service to the patients.

P18

Shift of Macrophage Polarisation after Achilles Tendon Ruptures: A Systematic Review**HT Xu, OKS Lee, PSH Yung***Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong*

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P19

Roles of Macrophages in Ageing-related Sarcopenia: A Systematic Review

BYH Wang, OKS Lee

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Background: Ageing-related loss of skeletal muscle mass, or sarcopenia, leads to the loss of functional mobility and independence in elderly people. As the worldwide population gets older, understanding of the mechanisms involved in ageing-related sarcopenia has become more and more important from the perspective of developing new therapeutics. There is emerging evidence indicating the possible roles of macrophages in the development of sarcopenia during ageing. The objective of this systematic review is to consolidate the current studies about the roles of macrophages in the ageing-related muscle tissue changes.

Methods: One hundred and four articles were included after searching on PubMed. After inclusion and exclusion selection, eight articles were selected for this systematic review.

Results: The number of total macrophages increases in ageing skeletal muscle tissues, indicating that the development of sarcopenia is associated with chronic inflammation. Cytokines secreted by M1 macrophages or M2 macrophages increase in varying degrees, and the balance between M1 and M2 macrophages is also related to ageing-related sarcopenia.

Conclusions: The limitations for this systematic review include the relative younger age control group, publication of the articles from the same research group, and the quality criteria for non-clinical research. The findings indicate the importance of the roles that macrophages play throughout the process of ageing-related sarcopenia. Nevertheless, the understanding of the functional roles of macrophages in sarcopenia is still inadequate. More efforts should be devoted in this particular line of research.

P20

Raman Spectroscopy to Detect Differentiation of Mesenchymal Stem Cells: A Systematic Review

TCT Cheng, OKS Lee

Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Raman spectroscopy has been widely used in detection of chemical compound as well as biomedical samples. Its possibilities and potential in stem cell research have also been explored. Conventional methods to evaluate the differentiation of mesenchymal stem cells (MSCs) are time-consuming and cell-destructing which make it difficult to continue observation. The aim of this systematic review was to evaluate the Raman spectroscopy system in the analysis of MSC differentiation.

Methods: We performed systematic search of full papers (PubMed) that investigated Raman spectroscopy in the analysis of MSC differentiation and that followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria. The initial search was performed by combinations of the relevant key words and word variants.

Results: The initial search produced a total of 168 articles after removing duplicates. After first round of screening for noncompliance with the inclusion criteria and the second round of full-text screening, a total of 13 articles were included in this systematic review. According to the included papers, Raman spectroscopy system has been demonstrated to be a reliable testing approach for monitoring MSC differentiation detection with high accuracy.

Conclusion: Although there are limitations, including the complexity, type, and sheer amount of data requiring specialised handling and analysis in this systematic review, Raman spectroscopy indeed provides effective and efficient analyses in the monitoring of MSC differentiation, considering its non-destructive, label-free, and cell-friendly characteristics, which can overcome the limitations of conventional analyses. The application of Raman spectroscopy in the study of stem cell biology could be further expanded and promoted.

P21

Optimal Micromotion for Rapid Fracture Healing Using a Novel Electronic Linear Servo Motor Actuator: A Pilot Study

WC Qi,¹ XR Feng,¹ CXS Fang,² FKL Leung²

¹Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong

²Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong

Introduction: The optimal amount of micromotion that is beneficial for callus formation and fracture healing is seldom studied and remains to be debated. Our objective is to accurately define the optimal amount of micromotion that may promote fracture healing.

Methods: Three groups (n=3 for each group) of 12-week-old female Sprague-Dawley rats with 2-mm segmental bone defect in the femur mid-diaphysis was bridged by a novel self-designed strain regulating external fixator. The 0% strain group (control), 10% strain group, and 20% strain group had the predefined micromotion precisely applied by an electronically controlled linear servo actuator, at a frequency of 0.6 Hz for 2 weeks after a 2-week static resting period. X-ray was taken weekly, and animals were sacrificed at 8 weeks with computed tomography (CT) scan to quantify callus volume.

Results: The average diameters of callus measured by X-ray at 8 weeks after operation increased from 3.28 ± 0.36 mm (control) to 3.84 ± 0.18 mm (10%) and 3.94 ± 0.63 mm (20%). The 10% group and 20% group had larger callus volume (26.65 ± 0.07 mm³ and 22.16 ± 11.04 mm³) than the control group (18.12 ± 4.51 mm³) measured by CT.

Conclusion: In all, 20% micromotion was superior in accelerating new bone formation over 10% and 0% micromotion. Increased sample size and testing for 30% and 40% micromotion are further required.

P22

Podiatric Foot Care Education Programme among the Elderly Patients in Hong Kong: A Pilot Study

HM Yeung,¹ SKK Ling²

¹Department of Podiatry, Queen Mary Hospital, Hong Kong

²Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Cross-sectional studies on foot problem in Hong Kong showed that 80% or more elderly patients had at least one foot problem, but the majority did not seek professional medical service. Worldwide, diabetic footcare education on elderly people showed success but targeted podiatric education on elderly people in Hong Kong was not well studied. This pilot study sought to find out which podiatric footcare education strategy was the most effective locally.

Methods: Recruited participants were aged >60 years attending the podiatry clinic. Sixteen participants were divided into four groups, and all received the same 15 minutes of verbal footcare education: Group A received verbal education only; Group B received an additional pamphlet; Group C received verbal education together with a relative; and Group D received both the verbal education together with a relative and received a pamphlet. The Chinese versions of the Foot and Ankle Outcome Scale (FAOS) and 36-Item Short Form Health Survey (SF-36) were given to participants to fill in prior to the first consultation and at the follow-up consultation after 4 weeks.

Results: Group C had the highest FAOS and SF-36 scores, followed by Group D. Groups A and B had significantly lower FAOS and SF-36 scores than C and D.

Conclusion: Engagement of family support enhanced the effect of foot care education programme, but it is a luxury that many elderly patients do not have. Paper pamphlets were not useful, and the authors suggest that other forms of information such as videos and digitised technology may be of more benefit.

P23

Novel Thread Design Reduces Migration of Screws in Surrogate Osteoporotic Bone under Multiaxial Loads

XR Feng,¹ EU Boles,² S Kulper,² CXS Fang,¹ WWJ Lu,¹ FKL Leung¹

¹*Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong*

²*Lifespans, Ltd, Hong Kong*

Introduction: Conventional bone screws have relatively high levels of migration failure in patients with osteoporotic bone. Lateral forces are often ignored in screw design in favour of axial pull-out forces. We present and examine a novel thread design with an undercut feature that sandwiches bone tissue between the screw shaft and thread to improve resistance to lateral migration.

Methods: Novel thread and typical buttress thread locking screws (n=5 per group; outer diameter 4.5 mm, core diameter 3.2 mm, length 42 mm) were implanted in osteoporotic bone substitute (10 PCF polyurethane foam per ASTM F1839). Individual screw lateral migration resistance was tested by recording lateral force during 5 mm/minute displacement control to a depth of 10 mm. Screw pair with plate cyclic craniocaudal/torsional migration resistance was tested by recording displacements during increasing cyclic force control.

Results: (Experiment A) For lateral force at 1.7 mm lateral displacement: novel thread (296 ± 6.50 N, $p < 0.001$); buttress thread (270 ± 2.77 N). At 5 mm: novel thread (323 ± 10.4 N, $p = 0.003$); buttress thread (300 ± 6.16 N). (Experiment B) In cyclic craniocaudal loading resistance test with locking plate, for force and cycle number at 5 mm lateral displacement: novel thread (721 ± 29.6 N, $p < 0.001$, 1087 ± 59.7 cycles, $p < 0.001$); buttress thread (599 ± 32.8 N, 850 ± 61.8 cycles). (Experiment C) In cyclic torsional loading resistance test with locking plate, for torque and cycle number at 10° angular displacement: novel thread (2794 ± 22.7 Nm, $p < 0.001$, 413 ± 7.28 cycles, $p < 0.001$); buttress thread (2369 ± 31.2 Nm, 359 ± 22.7 cycles).

Conclusion: The novel thread design significantly improves lateral migration resistance under both static/cyclic craniocaudal and torsional loading conditions in osteoporotic bone.

P24

Decompressive Surgery for Malignant Spinal Cord Compression in the Era of Effective Systemic Therapies: Impact on Overall Survival and Functional Outcome

BKY Chan,¹ SCT Wong,¹ TC Lam,² KYH Kwan³

¹*The University of Hong Kong, Hong Kong*

²*Department of Clinical Oncology, Queen Mary Hospital, Hong Kong*

³*Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong*

Introduction: In 2005 the Patchell's group published the only randomised controlled trial on the beneficial role of decompressive surgery in malignant spinal cord compression (MSCC). In the past decade, novel systemic anticancer treatments achieved high disease response rate and its role in MSCC remains to be defined.

Methods: A cohort of 259 patients with high-grade MSCC between January 2008 and December 2018 were retrospectively reviewed. Inclusion criteria were: (1) magnetic resonance imaging-confirmed epidural spinal cord compression (ESCC); (2) Grade 2 or above MSCC according to ESCC scale. Exclusion criteria were: (1) haematological malignancy; (2) intramedullary or intramural tumour. Patients were stratified into two groups according to druggability for systemic treatment defined by ER+ / HER2+ breast cancer, EGFR mutation/ALK/ROS1 aberration in lung cancer, and castration-sensitive prostate cancer. Demographic data, overall survival (OS), and functional status were recorded.

Results: Among the 259 patients, 44 received surgery, 67 received systemic drugs according to the tumour's druggability. In the group without druggable targets, decompressive surgery carried significant OS benefit (median, 246 vs 55 days; $p=0.0004$). However, in the group with druggable targets, decompressive surgery was not associated with significant OS benefit (638 vs 372 days, $p=0.25$). Multivariate regression on OS showed that the use of systemic therapies (relative risk [RR]=2.48, $p<0.001$) was the strongest favourable factor, followed by decompressive surgery (RR=1.98, $p<0.001$) and pretreatment American Spinal Injury Association (ASIA) score D or above (RR=1.37, $p<0.026$). Multivariate analysis of 3rd- and 6th-month post-treatment ASIA score showed that pretreatment ASIA was the only significant predictor.

Conclusion: With effective systemic anticancer therapies, beneficial role of decompression surgery in OS may be diminished. For functional outcome, pretreatment status is the strongest predictor.

P25

Comparison of Two Rehabilitation Protocols (Extension Rehabilitation versus Traditional Rehabilitation) in Total Knee Arthroplasty for Patients with Preoperative Fixed Flexion Deformity: A Randomised Controlled Trial

KW Chen,¹ KC Chan,¹ SS Yeung,² PK Chan,³ CH Yan,⁴ KY Chiu⁴

¹*Department of Prosthetics and Orthotics, Queen Mary Hospital, Hong Kong*

²*Department of Physiotherapy, MacLehose Medical Rehabilitation Centre, Hong Kong*

³*Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong*

⁴*Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong*

Introduction: Residual fixed flexion deformity (FFD) affects patient's function after total knee arthroplasty (TKA), which is not uncommon for patients with preoperative FFD. This study aimed to study the effect of different rehabilitation protocols on the recurrence of FFD after TKA.

Methods: This was a paired single-blinded randomised controlled trial. Patients were randomised into two groups (intervention [I] versus control [C]). Patients in intervention group (I) were treated with rehabilitation protocol with emphasis on quadriceps strengthening in adjunct to usual rehabilitation (C). Patients were assessed preoperatively, postoperatively 6 weeks, 3 months and 6 months. Primary outcome was knee range of motion. Secondary outcomes included Knee Injury and Osteoarthritis Outcome Score, Knee Society Knee Score, Knee Society Function Score (KSFS), knee strength, timed up and go test (TUGT), and 6-minute walk test (6MWT).

Results: Twenty patients (mean age, 77.1 ± 6.2 years) were included (randomisation 1:1). The preoperative FFD in both groups were comparable (I= $13.5 \pm 6.8^\circ$; C= $11.8 \pm 6.4^\circ$, $p=0.542$). No significant differences were shown in all outcomes between the two groups at 6 weeks, 3 months and 6 months after surgery ($p>0.05$). During 6-month follow-up, number of recurrent FFDs (passive knee extension $>10^\circ$) was two in the intervention group and three in the control group. Further subgroup analysis for comparison of patients with or without recurrent FFD showed significant better outcomes in patient without recurrent FFD, including passive knee extension ($2.1 \pm 2.6^\circ$ vs $12.3 \pm 2.3^\circ$, $p=0.001$), TUGT (8.7 ± 1.9 s vs 13.3 ± 4.6 s, $p=0.004$), 6MWT (401.5 ± 73.0 m vs 288.3 ± 69.5 m, $p=0.005$), and KSFS (58.1 ± 6.9 vs 50.0 ± 5.5 , $p=0.023$). All patients with recurrent FFD showed FFD in their contralateral knee.

Conclusion: Our extension rehabilitation protocol did not alter the incidence of recurrence of FFD. Other factors may influence the recurrence, such as contralateral knee FFD.

P26

Corrective Osteotomy for Malunited Distal Radius Fracture with Three-dimensional Printed Patient-specific Instrument Guide: A Case Report

NP Tang, KC Lau, MSY Lee, ECS Chow

Department of Orthopaedics and Traumatology, United Christian Hospital, Hong Kong

Patient-specific instruments are getting more prevalent in orthopaedics following a more mature development of three-dimensional (3D) printing technology. Creating a computerised and physical anatomic model by processing traditional two-dimensional imaging data, surgical planning can be individualised especially for patients with distorted anatomy. Accurate execution in surgeries could shorten the operating time, lower the chance of complications, and provide a better postoperative outcome for the patients. We report a patient with distal radius fracture malunion who subsequently underwent corrective osteotomy of distal radius with the aid of patient-specific osteotomy guide. A 57-year-old male patient presented with an accidental fall sustained a fracture left distal radius. Open reduction and internal fixation were initially done but the fracture healed with significant radial shortening, dorsal tilting, and reduced radial inclination due to suboptimal fracture fixation. Corrective osteotomy was planned due to significant persistent wrist pain. By comparison of the computerised tomography images with the contralateral normal wrist, the site and angle of osteotomy cut was planned, and a patient-specific 3D printed osteotomy guide was designed and manufactured. During the operation, the planned osteotomy cut was efficiently executed with the facilitation of the 3D printed guide. Opening wedge osteotomy was completed with iliac crest bone graft and volar plating. The postoperative alignment of the osteotomy and the immediate outcome was satisfactory. The patient is under follow-up for long-term outcome assessment. Patient-specific instruments with 3D printing technology can facilitate operation especially in patients with distorted anatomy and can be achieved in a local hospital.

P27

Immediate Contralateral Local Osteo-enhancement of the Hip in Postmenopausal Women with Fragility Hip Fracture: Early Interim Results of a Prospective Study

CXS Fang, DKH Yee, D Wong, TW Lau, TM Wong, FKL Leung

Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong

Introduction: Hip fractures are common fragility fractures and are associated with significant morbidity and mortality. Patients with a first hip fracture are at high risk of contralateral hip fracture within 1 year. The AGN1 local osteo-enhancement procedure (LOEP) is a novel intervention that may help prophylactically reduce the risk of contralateral hip fracture. This study aimed to evaluate the feasibility and safety of performing LOEP on the contralateral hip in the same operative session for a first-time fracture.

Methods: This is a prospective single-arm cohort study of 20 patients. Each patient underwent repair of the fractured hip followed by treatment of the contralateral hip with LOEP in the same operative session. The primary endpoint was the incidence of all serious adverse events occurring from the day of procedure through the 24-month follow-up period related to femoral LOEP. The secondary endpoints were the incidence of fragility fractures occurring during the follow-up period; all adverse events related to LOEP; and serial evaluation of bone mineral density post-procedure.

Results: No adverse events were directly related to the device or procedure. There was no increase in perioperative complications, length of stay, or time to weightbearing. No patients experienced fractures, pain or discomfort at the injected hip. By 12 months, the AGN1 core was replaced by new bone integrated with surrounding host bone.

Conclusion: The preliminary data at 12 months support the feasibility of AGN1 LOEP as a concomitant treatment of the contralateral hip in patients with a first hip fracture.