as a chemosensor for harmful exogenous compounds and mediates pain and neurogenic inflammation. More recently, TRPA1 has been found to be activated also by endogenous compounds formed in inflammation, such as reactive oxygen and nitrogen species. That prompted us to investigate the role of TRPA1 in inflammatory conditions including osteoarthritis.
Monosodium iodoacetate (MIA) -induced arthritis is a widely used animal model of osteoarthritis. We found that MIA evoked acute inflammation, degenerative cartilage changes and joint pain in wild type mice; but interestingly, those responses were significantly attenuated in TRPA1 deficient animals. Furthermore, TRPA1 was found to be expressed and inducible by inflammatory factors including IL-1 and IL-17 in primary human OA chondrocytes; and the TRPA1 channel was shown to be functional based on calcium influx assays. Pharmacological inhibition and genetic depletion of TRPA1 downregulated the production of inflammatory factors and MMP enzymes in mouse cartilage and primary human OA chondrocytes.
The present results introduce TRPA1 as a plausible factor involved in the pathogenesis of OA and provide a novel target for analgesic and anti-inflammatory drugs with disease modifying potential in OA.
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Wearable technologies in 21st century healthcare

SP0023 REVIEW OF WEARABLE TECHNOLOGIES

A.M. Clarke-Cornwell. *School of Health Sciences, The University of Salford, Manchester, United Kingdom*

Working environments have in recent times become less physical with the increase in sedentary, computer-based occupations. Sedentary time is known to be associated with a number of health-related outcomes, including obesity, heart disease, diabetes, cardiometabolic risk factors, some cancers and early mortality, independent of physical activity. There is limited research that has examined sedentary time and physical activity and associations with musculoskeletal conditions, despite these being responsible for the majority of work-related ill health and days absent from work.
The validity and practicality of objective and subjective techniques to measure physical behaviour have been widely reported; however, there is no gold standard that is valid, accurate, reliable and also practical. Self-reported methods can be practical and low-cost, but are subject to recall and social desirability bias; whereas objective devices, such as accelerometers, can be expensive, but allow for information on intensity, frequency and duration of activity to be measured.
The Health Survey for England 2008 used both subjective and objective measures of physical activity: they found that 39% of men and 29% of women were meeting the recommended levels of physical activity when asked via a questionnaire. In comparison, when physical activity was objectively measured using an accelerometer, it was found that only 6% of men and 4% of women met these targets.
Wearable technologies, including research grade accelerometers (e.g. activPAL™) and consumer wearables (e.g. FitBit), are increasingly being used in research, not only to measure physical behaviours but may also be useful in facilitating and monitoring behaviour change. This work will present an overview of wearable technologies used in research, what they can (and can't) measure, and in particular their application in musculoskeletal research.
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SP0024 WEARABLE TECHNOLOGIES IN RESEARCH AND CLINICAL TRIALS

M. Mc Carthy. *IT Innovation, Icon Plc, Dublin, Ireland*

The use of wearable technology in clinical trials has the potential to be one of the most disruptive innovations in drug development. The cost and duration of the current clinical trial design has been under scrutiny for a number of years with the sustainability of the exiting model under question. A critical success factor is adequate patient recruitment and retention. Recent initiatives to redesign the clinical trial process have focused on the creation of trials that are more patient focused. A wealth of medical grade physiological data is now readily available from wearable technology, with the potential to create a new future where patients no longer have to visit research sites and where real-time data are available remotely.
However, integrating wearables into a clinical trial is more complex than simply giving the patient a smartwatch and spontaneously generating clinically relevant data. Focusing on technology and sandwiching it into a trial is not a best practice. Wearables need to be viewed as a component of an overall patient-centric strategy rather than solutions in themselves. When creating a remote trial, simply shifting the burden from the sites to the patients, requiring them to carry out a number of tasks in an unsupported, uncontrolled environment is neither welcome nor sustainable. The process for successful selection and integration of wearables needs to take a number of criteria into consideration; clinical hypotheses, the value that is gained by the inclusion of wearables, the robustness of the data generated by the devices, and ensuring that the data adds clarity not additional complexity to the trial.
The re-engineering of the clinical trial to create a patient focused trial goes beyond mere convenience. Wearables and sensor have the potential to generate digital maps of individual's physical behaviours. Wearable technology is facilitating the remote capture of real life data but also has the potential to create new end points and outcome measures that are meaningful to the patient and could hold the key to a new clinical trials paradigm.
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Assessment and management of osteoporosis

SP0025 THE USE OF BIOMARKERS FOR OSTEOPOROSIS CLINICS

K. Akesson. *Clinical Sciences Malmö, Lund University, Malmö, Sweden*

The balance between bone resorption and bone formation is maintained through a complex regulatory system of systemic and local factors acting on bone cells, such as calcium regulating and sex hormones, growth factors and cytokins. Furthermore, the competence of the bone cells and the number of active cells will determine the production of bone matrix proteins, while other incompletely understood intrinsic mechanisms will determine mineralization and micro-structure. Exposure of the matrix after osteoclastic activation allows for proteolytic enzymes to commence the degradation of the collagenous structure. The signals responsible for termination of bone resorption and initiation of bone formation (coupling) are not yet completely understood. Nevertheless, a tight coupling between resorption and formation is required to maintain bone mass and to preserve the micro-architectural integrity of bone.
Based on this knowledge markers of bone metabolism have been developed. These markers have been evaluated in terms of their ability to predict fracture, change in bone mass, and response to pharmacological treatments in clinical trials and additionally to monitor treatment in clinic.
The lecture will cover the use of markers in clinical trial, interpretation of change in markers from currently available and potential new drugs and to what extent and how to best apply in clinic.
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SP0026 NOVEL IMAGING TECHNIQUES FOR ASSESSING OSTEOPOROTIC FRACTURE RISK

R. Chapurlat[1,2]. [1]*Université de Lyon;* [2]*Medicine, INSERM UMR 1033, Lyon, France*

The measurement of areal bone mineral density (aBMD) by dual x-ray absorptiometry (DXA) has been the mainstay for the diagnosis of osteoporosis for at least two decades. The sensitivity and specificity of this test, however, remains suboptimal. For example, more than 50% of postmenopausal women with fragility fracture are not identified with DXA. A great deal of research has been performed recently to develop alternative or complementary imaging techniques to overcome DXA predictive limitations. These techniques are based on the non invasive analysis of bone microarchitecture and estimation of bone strength by finite element analysis (FEA).
Texture analysis uses mathematical models based on fractal analysis to evaluate bone microarchitecture using various types of bone images. The trabecular bone score (TBS) has emerged as an approach that may improve fracture risk prediction. The TBS is based on the texture analysis of the DXA lumbar spine image to quantify bone microarchitecture. Several cohort studies have shown that a subset of individuals could be reclassified with TBS. A meta-analysis results have allowed for incorporation of the TBS in the FRAX score calculation, that is widely available.
The measurement of volumetric BMD with quantitative computerized tomography (QCT) at the hip has been shown to predict fracture risk. These images can also be used to perform FEA that may increase the fracture risk prediction. The additional value of this technique compared with DXA remains to be established in a clinical setting.
Bone microarchitecture can also be assessed at peripheral sites such as the distal radius and tibia using high resolution peripheral quantitative tomography (HRpQCT). Numerous cross-sectional and case-control studies have shown a significant association between prevalent fracture and bone microarchitecture and estimated bone strength assessed with FEA. The bone parameters measured at distal sites are also associated with fractures at distant sites, e.g., the vertebrae and the femoral neck. In a recent prospective study, bone microarchitecture at the distal radius - especially the trabecular vBMD - has been associated with incident osteoporotic fracture. The FEA models were also predictive of fragility fracture. The best models and the most appropriate architectural parameters - whether they are trabecular of cortical - remain to be dissected out and their comparative diagnostic value with aBMD by DXA remains to be established.
The measurement of the TBS may allow for reclassification of a subset of