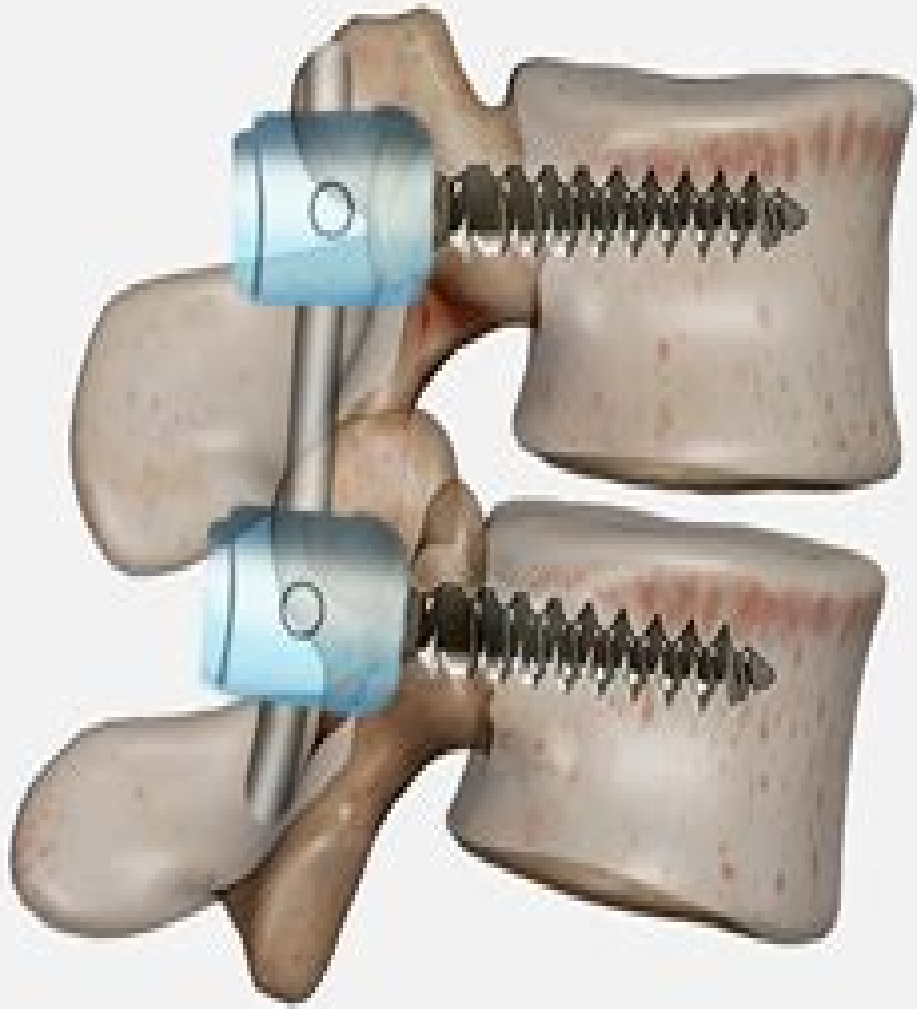




Spinal Fusion

Kai-Uwe Lewandrowski



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Spinal Fusion Jerome M. Cotler, Howard B. Cotler, 2012-12-06 Spinal Fusion Science and Technique puts the experience of top professionals into your own hands Drs Jerome M Cotler and Howard B Cotler and their impressive group of contributors including researchers educators and clinicians have joined together to bring you this concise comprehensive reference Sections relating to history basic science surgical indications and techniques complications postoperative management as well as a philosophical chapter on the future of spine surgery are presented With the help of over 250 superb illustrations Spinal Fusion Science and Technique contains the most current and authoritative compilation of knowledge relating to surgical management of disorders of the spine It is destined to become an essential tool in your working library

Advances in Spinal Fusion Kai-Uwe Lewandrowski, 2003-10-21 Advances in Spinal Fusion reveals a new generation of materials and devices for enhanced operations in spinal fusion This reference showcases emerging research and technologies in areas such as biodegradable implants drug delivery stem cell isolation and transfection cell encapsulation and immobilization and the design of 2D and 3D scaffolds for cells It captures a cascade of innovations crucial to increased healing and decreased morbidity in spinal fusion methods and mechanics and addresses current standards in analytical methodology and quality control it describes the selection of biomaterials for improved biocompatibility biostability and structure function relationships

Techniques in Spinal Fusion and Stabilization Patrick W. Hitchon, Setti S. Rengachary, Vincent Charles Traynelis, 1995 This popular book provides clear expert descriptions of the instrumentation

currently in use for spine stabilization and fusion Experienced surgeons discuss indications guidelines for patient selection operating room techniques anticipated outcomes potential complications and documented results Your understanding will be deepened by nearly 600 high quality surgical photographs and illustrations Excellent covers the majority of spinal stabilization procedures the authors are very knowledgeable recommended for those new to spinal stabilization and for experienced spinal surgeons *Journal of Orthopedic Trauma* *Advances in Spinal Fusion* Kai-Uwe Lewandrowski,2003-10-21 *Advances in Spinal Fusion* reveals a new generation of materials and devices for enhanced operations in spinal fusion This reference showcases emerging research and technologies in areas such as biodegradable implants drug delivery stem cell isolation and transfection cell encapsulation and immobilization and the design of 2D and 3D scaffolds for cells It captures a cascade of innovations crucial to increased healing and decreased morbidity in spinal fusion methods and mechanics and addresses current standards in analytical methodology and quality control it describes the selection of biomaterials for improved biocompatibility biostability and structure function relationships **Development of a Wirelessly Powered Smart Implant to Monitor Spinal Fusion** Nicole (Negar) Zoka,2021-01-01 Lumbar spinal fusion surgery is performed on patients in whom non operative treatments have failed to relieve chronic lower back pain LBP and restore functionality The procedure involves inserting titanium alloy rods adjacent to two or more vertebrae on each side of the spine to support spinal fusion Currently clinicians rely upon periodic x ray radiographic images to track fusion progress and determine whether patients can resume normal activities or to assess if the fusion has failed However the reliability of imaging evaluation techniques is questionable and leads to either very conservative and prolonged restrictions on activity or additional exploratory surgeries The definitive criteria for a successful fusion remain ambiguous and determining the progress of spinal fusion remains a challenge for orthopaedic surgeons and clinicians Observing strain variations on a spinal fusion rod post implantation has been demonstrated to correlate with changes in bony mass stiffness as fusion progresses indicating the state of fusion The challenge with strain measurements relates to having a reliable implant which aligns with existing clinical workflows and provides new data on the state of healing If the existing titanium alloy rod could be made smart i e the strain measurement capabilities are embedded into the rod then the existing clinical surgical workflow could be maintained This research focuses on the design and development of a smart spinal fusion implant with the potential to measure strain without complication in the surgical procedure To meet this aim two key research questions were addressed First a fully implantable wireless spinal rod was developed to support animal trials of spinal fusion The implant was constructed by mounting a semiconductor strain gauge sensor into a housing machined into a custom spinal rod A miniaturised electronic module was developed to measure the strain and transmit the data to an external wireless receiver The module consisted of a strain gauge signal conditioning which was controlled by a microcontroller and a custom wireless power and data transfer application specific integrated circuit ASIC developed previously at the Auckland Bioengineering Institute ABI The

electronics module was mounted into the housing and a printed circuit board PCB coil was placed on top of it This was sealed under a liquid crystal polymer LCP lid Wireless power was transferred to the implant from an external coil at 6.78MHz for 980ms over which 10 samples of strain were measured The data was then transmitted using phase shift keying at a data rate of 678kbps at 6.78MHz Data was received at an external coil demodulated and logged to a computer with a measurement cycle taking one second The implant was characterised on a test rig and it was confirmed that the 24 bit strain values could be wirelessly measured using the smart spinal implant designed to achieve 1 resolution This showed that the device was ready for animal trials to quantify strain as fusion occurs in a sheep model Second to make the implant clinically relevant it would be preferable to replace the LCP lid with titanium LCP is an appropriate seal for animal trials with a lifespan of around several months before water permeates through it and the device becomes unreliable Titanium can be welded to the rod to achieve a hermetic seal gas tight with a lifespan of many years which leads to a smaller device and eases reliable manufacturing as welding is possible However this would require transferring inductive power through the conductive titanium lid which has not been achieved in a spinal implant Thus inductive power transfer through metal sheets was investigated via a combination of numerical and experimental tests A simple test set up based on hand wound cylindrical 10 turn primary inner radius of 30mm and 10 turn secondary coils inner radius of 5mm was created into which metal sheets could be introduced to allow study their impact on wireless power transfer The equivalent 2D axisymmetric FEM models were developed to analyse inductive link principles and validate experimental studies The hand wound coils were also used to investigate the impact of a titanium enclosure on IWPT system parameters through both simulations and experiments The simulation results matched experimental results reasonably well validating the approach thus in the future the validated FEM simulations could be used to investigate power transfer to a miniaturised titanium packaged smart spinal fusion implant The impact of the titanium spinal fusion implant consisting of a titanium spinal rod housing and lid on an IWPT system and an optimum frequency for maximum power transfer was determined The maximum transferred power was dependent on the titanium alloy lid thickness implant size implant coil location frequency of power transmission magnitude of the primary field and primary and secondary coils dimensions and configurations FEM simulation results revealed that a maximum power of 1.84mW at 1A primary current and an operating frequency of approximately 400kHz could be transferred through a 1.10 mm thick Grade 5 titanium lid used to seal a 5.5mm thick 50mm long Grade 5 titanium rod and 0.5mm thick Grade 5 housing with an internal volume of 18 x 8 x 5mm L x W x H for this spinal fusion application The maximum link potential of 0.035 at 199kHz could be achieved for the same set up These results indicated that an acceptable amount of power could be transferred through titanium to power the implanted electronics supporting the future development of titanium packaged smart spinal fusion rods This research supports the hypothesis that it is feasible to construct a smart spinal fusion implant that includes the function of measuring strain can ultimately be employed in clinical practices of spinal fusion detection of

the onset of fusion non union or other complications determination of the efficiency of various bone treatments and the design of rehabilitation protocols The Encyclopedia of the Back and Spine Systems and Disorders Mary Harwell Sayler,Arya Nick Shamie,2007 Back pain is the most common cause of job related disability This is a reference to these parts of the body and the ailments of sufferers It provides information on various aspects of the back and spine including anatomy metabolic processes neurological systems injuries diseases and disorders treatments medicines and nutrition **Lumbar Fusion and Stabilization** Kazuo Yonenobu,Keiro Ono,Yoshiharu Takemitsu,2012-12-06 Lumbar spine or back pain is one of the most important problems in orthopedics and neurosurgery today Two key ways of treating this malady lumbar fusion and stabilization are critically discussed in the forty three papers in this volume They represent the best of the contributions to the 5th ICLFS carefully selected and edited to give a good overview of recent knowledge and the state of the art

Complications of Spine Surgery Howard S. An,Louis G. Jenis,2006 Written by internationally recognized experts this book is a comprehensive practical guide to prevention recognition and management of complications in spine surgery Sections cover the cervical spine and the thoracolumbar lumbosacral spine and discuss the full range of complications that may be encountered including those associated with the newest technologies procedures and instrumentation Each chapter focuses on a specific type of problem and presents how to strategies for avoiding and managing the problem in specific surgical procedures Of special note are the detailed discussions of complications related to instrumentation Each chapter includes extensive up to date references More than 150 illustrations complement the text **Interpreting Bone Lesions and Pathology for Forensic Practice** Lucie Biehler-Gomez,Cristina Cattaneo,2020-11-14 Interpreting Bone Lesions and Pathology for Forensic Practice presents a concise description of the necessary steps for the differential diagnosis of disease and trauma on skeletal remains Information obtained from the pathological reactions of bone can be fundamental for forensic dilemmas ranging from identification to understanding trauma The book s authors aim to provide reliable tools for the appropriate interpretation of lesions on bone through macroscopic radiological histological and biomolecular analyses on skeletal remains Provides tools for the proper interpretation of bone pathology and lesions Presents content that is based on modern and documented case studies Includes bone pathological reactions that are crucial for interpreting trauma

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