



A highly expandable cage for vertebral body replacement

Information Summary

Reference code:	ROI 07060
Technology overview:	Expandable cage for vertebrectomy
Application:	A medical device to replace a diseased vertebral body through a posterior surgery
Validation:	Prototype designed and tested on cadaver.
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Technology Description

Vertebral body excision or vertebrectomy is frequently required to decompress the spinal cord and/or stabilize the vertebral column in certain cases of trauma, tumor and infection. Vertebral bodies can be removed from either an anterior or posterior approach. Anterior approaches provide the widest access but are associated with considerable co-morbidities with respect to the throacotomy and abdominal wall pain. Posterior approaches are the least morbid but are limited by accessibility. Access from the posterior approach is limited to the space between the nerve roots. In order to get better access, a nerve root may have to be sacrificed, which is not an option in many regions of the spine. The current invention provides an elegant solution for a posterior approach without sacrificing the nerve roots.

Performance

The system consists of an expandable cage comprising an “accordion”-like design. The implant is initially

compressed and introduced by minimal invasive surgery via a posterior approach. In a compressed stage, the implant fits between patient’s nerve roots (no need to sacrifice them). Then the implant is expanded by filling it with bone cement. The cage expands several 100%’ to fill the space between vertebrae. Alignment of the end plate of the implant with the surrounding vertebra is therefore not an issue. With such a device surgeons will be able to complete vertebrectomy with a posterior approach.

Advantages

- Posterior approach – By conducting the surgery with a posterior approach, patients will not experience high co-morbidity associated with anterior approach. It also means that a larger patient population will be eligible for this surgery.
- Minimally invasive surgery – This surgery requires a small incision to remove the diseased vertebra an insert the expandable cage.
- Fewer side effects – Not sacrificing the nerve roots in addition to the posterior approach will dramatically reduce the side effects than the current standard of care.
- Ease of implantation – No endplate angulations required. One implant will fill any size of vertebrectomy defect, which will also reduce hospital inventory.

Market Need and Opportunity

The vertebral body replacement market is estimated at US\$100 million annually. This market is presently severely limited by the lack of adequate solutions (medical device and technique) and will expand once proper device(s) and tool(s) will enable posterior approaches without sacrificing the root nerves.



Dr. Peter Jarzem

BSc (Engineering), Queen's University, 1980

MD, Queen's University, 1984

FRCS(C), Orthopedics McGill University, 1990

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Research Focus: Developing novel orthopedic techniques and implants to facilitate surgery. Dr Jarzem's first project was to develop a new design for an elbow prosthesis. This project was carried out while he was a medical student and lead to the commercialization of a newly designed implant.

Since that time, Dr Jarzem has been involved in the testing and design of several families of porous metal intervertebral fusion implants. Currently his implant design interests lie in the area of minimally invasive techniques for vertebrectomy. The present project has lead to the development of a test implant that has demonstrated the feasibility of the implant, both in the biomechanics laboratory and in cadaver implantation trials. Other current projects include tracking real time spine deformity correction, and the development of least invasive techniques for deformity correction. Dr Jarzem has teamed up with leading thinkers in spine surgery to develop and protect new intellectual property.

Other research interest include the biomechanics of spinal cord injury and mitigation, clinical outcome after intervertebral fusion with a variety of different spinal implants and the use of a non fusion techniques as treatment for low back pain and spinal stenosis.