cancer voices australia

POSITION STATEMENT

STEREOTACTIC RADIO-SURGERY AND RADIO-THERAPY

Developments in the technology applied to radiotherapy have meant that in recent years there has been the ability to treat tumours with extremely high precision allowing the delivery of extremely high doses to tumours with minimal damage to surrounding tissue. The term radiosurgery has come into use along with proprietary names such as Cyber-knife and Gamma -knife.

This Position Statement seeks to provide information about this technology and its availability within Australia.

We also make a number of **recommendations**:

- that patients, particularly those with brain tumours, be made aware of this technology as an alternative both to surgery and conventional radiotherapy.
- that within Australia there should be available examples of the different technologies available in this are so that there can be adequate evaluation of the alternatives.
- that the Medical Services Advisory Committee further review these technologies and adjust the MBS reimbursement to more accurately reflect the cost of providing this treatment and the different technologies.

What is Stereotactic Radiosurgery and Stereotactic Radiotherapy?

Stereotactic radiosurgery (SRS) in Australia means a single treatment, whereas in some parts of the world, up to 5 treatments are still referred to as radiosurgery. Multiple fractions or treatments can be referred to as stereotactic radiotherapy (SRT) with the same requirement for daily quality assurance checks for machine accuracy and image guidance. Stereotactic body radiotherapy (SBRT) uses the principles of brain and skull base stereotactic radiosurgery to treat small targets within the chest or abdomen, often with implanted markers within the tumour or by reference to adjacent normal anatomy. The lack of an external reference system can blur the distinction between stereotactic treatments and highly conformal image guided irradiation The machines used by Radiation Oncologists for SRS and SRT deliver radiation with potentially sub-millimetre precision based on accurate delineation of targets with computed tomography (CT), magnetic resonance imaging (MRI), and angiography of the brain. Such accuracy requires markers called fiducials to be present on the image sets and present at the time of treatment. Advances over the last ten years or so, mean that bony anatomy or implanted markers within the body, can be used as fiducials. Moreover, advances in robotics mean that adjustments can be made to patient positioning before and during treatment to ensure no decline in accuracy even with multiple treatments. The radiation is delivered using multiple highly collimated beams or non-coplanar arcs to reduce dose to healthy adjacent organs or tissues.

- Stereotactic radiosurgery and radiotherapy relies on several technologies:
- Three-dimensional imaging that determines the exact coordinates of the target within the body and the relevant normal tissue anatomy

- Immobilisation and positioning devices to comfortably secure the patient
- Highly collimated gamma-ray or x-ray beams that converge on a tumour or abnormality.
- Image-guided radiation therapy (IGRT),which uses medical imaging to confirm the location of a tumour immediately before or during the delivery of radiation to further improve the precision and accuracy of the treatment, including the use of robotics to fine tune patient position and adjustment of the beam to negate respiratory movements (respiratory gating)

Three-dimensional imaging, such as CT, MRI, and PET/CT are used to locate the tumour or abnormality within the body and define its exact size and shape. These images guide the treatment planning—in which beams of radiation are designed to converge on the target area from different angles and planes (non-coplanar treatment)—as well as the careful positioning of the patient for treatment with kilovoltage (diagnostic quality) Xrays or CT scans taken before or during treatment.

Stereotactic radio-surgery and SBRT are important alternatives to surgery or conventional irradiation, especially for patients who are unable to undergo surgery and for tumours and abnormalities where:

- Equivalent outcomes can be demonstrated e.g. Acoustic neuroma
- SRS/SRT allows preservation of organ function e.g. Optic nerve sheath meningioma
- Surgical access is limited or surgical risk is unacceptable eg.Brainstem metastasis
- Where control rates may be regarded as superior to conventional irradiation e.g. T1No Peripheral Lung Cancer
- Where previous radiation has reached critical organ tolerance e.g. retreatment of spinal metastases

Radiosurgery is used to treat many types of brain tumours and usually restricted to a maximum size of 2.5-3cm although this can vary depending on location. Such treatments are often undertaken with neurosurgical input particularly in terms of target delineation and critical normal structures

SBRT is currently being investigated for use in treating malignant tumours generally less than 5 cm in other parts of the body. Indications include primary lung or a limited number of metastatic tumours to the lung, some liver tumours or metastases. Such treatment treats the demonstrable mass with no attempt to treat adjacent lymph nodes. Often 3-5 treatments may be used instead of the usual 30 treatments with conventional radiotherapy.

Stereotactic radiosurgery works in the same way as other forms of radiation treatment. It does not actually remove the tumour; rather, it damages the DNA of tumour cells and perhaps tumour related vasculature.

Where SRS is currently offered in Australia?

NSW
Royal Prince Alfred Hospital, Sydney
Macquarie University Private Hospital, Sydney
Prince of Wales Hospital, Sydney
Westmead Hospital Sydney

Victoria
William Buckland Radiotherapy Centre, Melbourne
Peter Mac Cancer Institute, Melbourne

SA
Royal Adelaide Hospital, Adelaide

WA
Charles Gardner Hospital, Perth

QLD
Wesley Hospital, Brisbane

Only a few however, offer the full range of micro-collimators - real time image guidance and robotic positioning

MSAC Reviews

In 2006 MSAC reported - Gamma Knife radio-surgery is safe, appears to be effective, but is not cost effective when compared with Linac stereotactic radiosurgery.
MSAC recommends that current funding arrangements should not be changed.

Options

LINAC based

Link to video - http://www.jacmp.org/index.php/jacmp/article/viewArticle/3223/1945

Cobalt 60 (Co60) based

Is used medically for radiation therapy as implants e.g. 60cobalt plaque for eye brachytherapy and as an external source of radiation exposure.

The Different Systems are:

Elekta Gamma-knife Co60 System

Link to video - http://vidego.multicastmedia.com/player.php?v=ka6plarb

Cyber-knife Stereotactic Robotic Treatment Unit

The CyberKnife is a frameless robotic radio surgery system used for treating benign tumors, malignant tumors and other medical conditions. The two main elements of the CyberKnife are

(1) The radiation produced from a small linear particle accelerator and

(2) A robotic arm, which allows the energy to be directed at any part of the body from any direction.

Brain-lab Novalis TX Linear Accelerator

The Novalis Tx radiosurgery platform incorporates sophisticated beam shaping technology, precision targeting computers and robotics that sculpt the treatment beam so that it envelops the tumor while avoiding the surrounding tissues and organs as much as possible. The Novalis Tx radiosurgery platform also offers a broad range of image-guidance tools to further

enhance treatment precision. Clinicians are able to generate 3-D scans of the tumor and surrounding tissues prior to and during every treatment, to ensure that tumors are targeted accurately.

Varian Trilogy Linear Accelerator

The Trilogy incorporates tools for delivering highly-accurate image-guided radiotherapy and radio-surgery treatments, including cone-beam (3-D) and kV (2-D) imaging as well as respiratory gating to compensate for tumor motion during treatment. The Trilogy machine can also be outfitted with RapidArc for faster treatment delivery. Generally the use of a single arc does not lead to the conformal dose distribution associated with stereotactic irradiation.

Elekta Axesse Linear Accelerator

The Elekta Axesse™ image guided stereotactic treatment delivery accelerator provides proven high conformance dose delivery through fine resolution beam shaping in conjunction with a suite of sophisticated treatment delivery techniques and sub-millimeter accuracy using the latest in image guided technology.

Patient Considerations

Cost/s

A Medicare rebate is offered for stereotactic treatment planning and delivery. Most centres however, use the usual rebates for 3D conformal treatment planning. No rebate is available for robotic patient positioning or real time correction during treatment, which has replaced invasive head frames in some centres. No specific rebate is available for gamma knife, in line with MSAC recommendations.

There may be considerable out of pocket expenses above the rebate when the procedure is undertaken in a private facility reflecting the true cost of highly specialized technology and staff costs. No data is available to look at the savings compared with conventional surgery where outcomes are thought to be equivalent. Similarly no data is available to look at the savings in resource utilization from treating with a small number of stereotactic treatments compared with multiple conventional treatments.

Currently, there is a single item number (15600) covering stereotactic radiosurgery that bundles medical consultation, planning, simulation, dosimetry and treatment and (anecdotally) also includes any Radiation Oncology Health Program Grant (ROHPG) component re-imbursing the significant capital cost associated with stereotactic radiosurgery. SRS is specifically excluded otherwise from ROHPG arrangements. In practise it is not possible to unbundle the Medicare rebate or ROHPG components paid under 15600 and this needs to be addressed as capital funds are, as a result, lost to hospital operating consolidated revenues. Bundling such services together is also an inflexible means of funding the changing techniques and technologies associated with SRS and this also needs to be addressed.

Recent Medicare decisions affecting arc therapy and volumetric modulated arc therapy (VMAT) restricting rebates for any treatment involving an arc type treatment to 3 fields has introduced reimbursement anomalies. For example, conventional radiotherapy may be billed for up to 6 static fields, i.e. 1st field plus 5 additional fields however simple or complex the technique may be, whereas a SRT technique employing 6-7 arcs (not static fields) may only be re-imbursed for 3 fields as if they static fields. Currently, the average static fields per conventional treatment attendance ranges around 3.5 to 4 fields whereas the average number of arcs per SRS or SRT treatment is generally around 4 to 5 and for static fields 6 to

7, yet only 3 fields may be billed where an arc is employed. Clearly there is an anomaly here and a financial disincentive for SRT arc therapy which is otherwise effective and efficient treatment.

Restraint systems

Two types of restraint are available for stereotactic radiosurgery to the head. The traditional invasive headframe e.g. Brown-Cosman-Wells headframe uses metal or ceramic pins which are secured to the outer table of the skull after local anaesthetic, usually by a neurosurgeon. Robotic positioning systems e.g. Novalis Tx use thermoplastic masks. The latter are not reusable for other patients and the costs involved are not reimbursed.
Stereotactic radiotherapy to the head may also use these thermoplastic masks or a bite block attached to a frame surrounding the head.
Body stereotactic procedures use vacuum locked restraint systems and image guidance to adjust for any movement.

Recommendations

CVA supports the continuing evolution of SRS systems to improve patient care and increase the knowledge base in Australia. In particular we consider that there should be evidence based information made available to all patients with brain malignancies where SRS or SRT would offer alternatives to conventional surgery or radiotherapy

We consider that examples of the different technologies should be available in Australia, both to increase the knowledge base and provide alternatives for patients. So for example, we would support the establishment of Cyberknife and Gammaknife technologies within the public radiotherapy system.

We consider that the Medical Services Advisory Committee should conduct a further review to define appropriate MBS item numbers to reflect the increasing complexity of Stereotactic radiosurgery and radiotherapy is recommended. Such a study may reveal significant savings by providing cost effective alternatives to surgery and conventional radiotherapy as well as improving patient outcomes.

In summary our recommendations are:

- that patients, particularly those with brain tumours, be made aware of this technology as an alternative both to surgery and conventional radiotherapy.
- that within Australia there should be available examples of the different technologies available in this are so that there can be adequate evaluation of the alternatives.
- that the Medical Services Advisory Committee further review these technologies and adjust the MBS reimbursement to more accurately reflect the cost of providing this treatment and the different technologies.

November 2011