In this slide show we are going to illustrate how we perform frameless stereotactic radiosurgery in patients with brain metastases in Department of Clinical Oncology, Prince of Wales Hospital.

In the preparation of treatment, we ask our patient to come back in a day for mould fitting. In the past we used framed mould but it would cause pain. Nowadays, we use a specific frameless mould which consists of a thermoplastic shell and localiser like in this picture.

With the patient putting on the mould, we perform a set of planning CT and co-register the image with fine-cut MRI performed before. Then we do contouring of the gross tumour on the Brainlab iPlan system. A 1.5-mm margin will then be added from gross tumour volume to form the planning target volume to account for set-up error.

Our physicists will then perform dosimetric calculation with intensity modulated radiotherapy planning, using non-coplanar photon beams. The dose given to the tumour and organs at risk would then be visualised using the iPlan system. Treatment to more than one lesion up to four lesions less than 4 cm each can be treated in 1 or 2 days.

This is our linear accelerator machine, with a robotic couch which allows 6 degree of freedom and ExacTrac verification system. The X-ray sources are installed in the ground. The flat panels mounted from the ceiling detect the X-ray which would generate the verification image.

Couch motion will then be traced by the ceiling mounted infrared camera.

In the treatment machine, an add-on Brainlab m3 micro-MLC 3-mm system allows high precision of treatment beams.

Before treatment, we need to verify patient's treatment position. Our radiotherapists would take X-ray images detected by the flat panels like in this picture.

The XR images will be registered with the treatment planning images.

The 6-degree treatment couch allows 3D translational and rotational shift.

After verification, treatment can be safely delivered. Usually treatment of one lesion will last for 15 minutes.

Let us look at a brief video demonstration of how the treatment is carried on in a dummy.

The couch rotation allows non-coplanar beam delivery.