

The interesting clinical example

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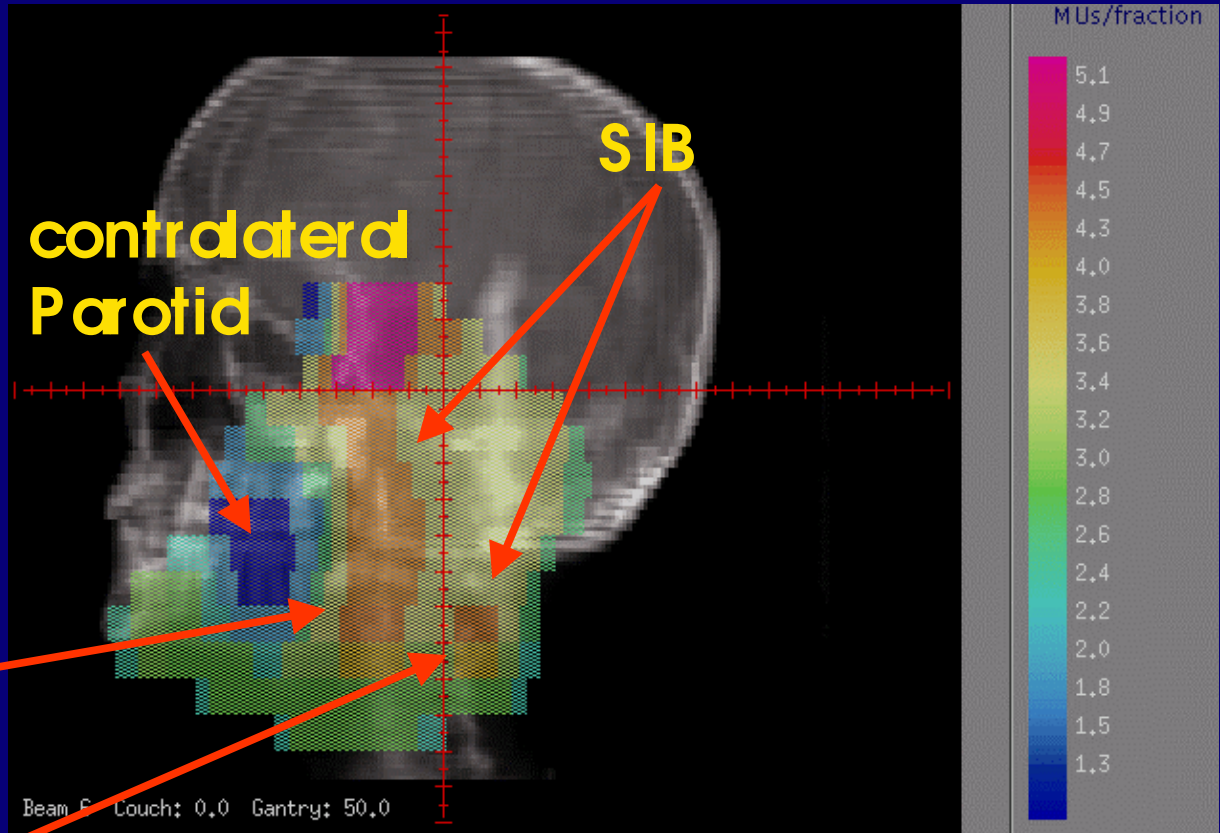
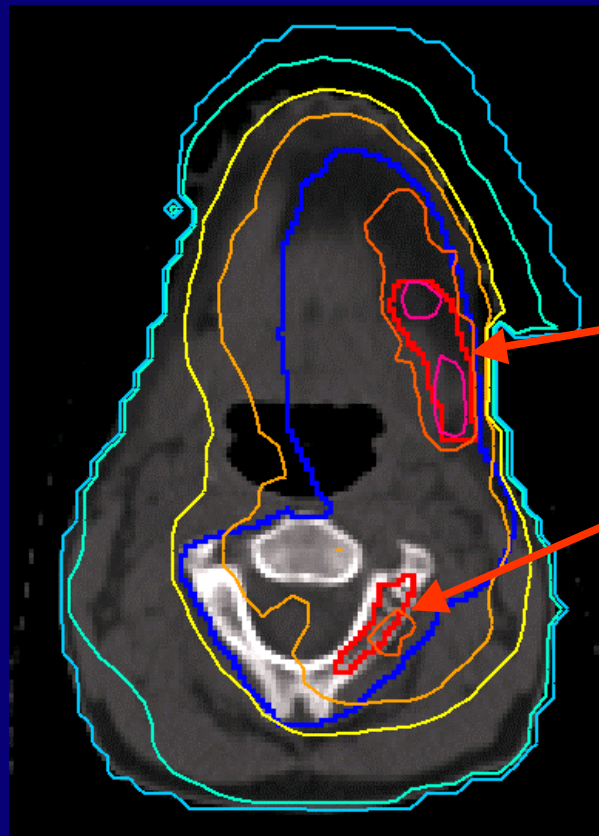
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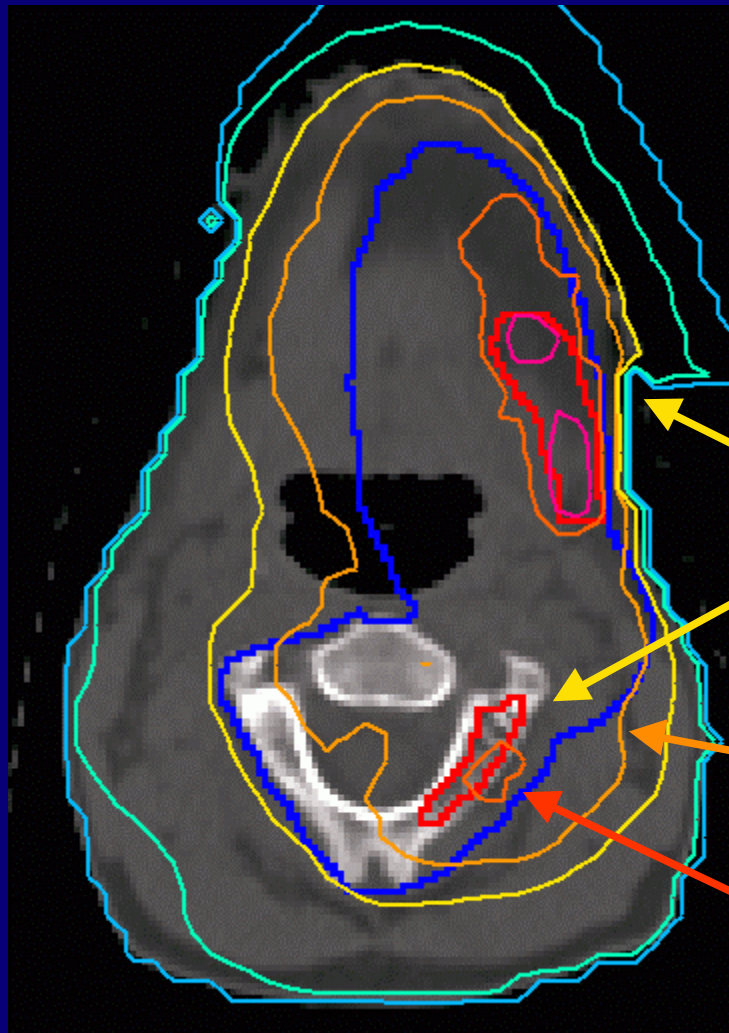
Rhabdomyosarcoma, 11 yrs old

treatment:
hyperfractionated,
twice daily 1.6 Gy



treatment impossible with conformal RT,
because:

Problem 1: infiltration of a vertebra



The decision was made to irradiate the entire vertebra to 32 Gy to avoid unilateral growth inhibition, but spare the spinal cord.

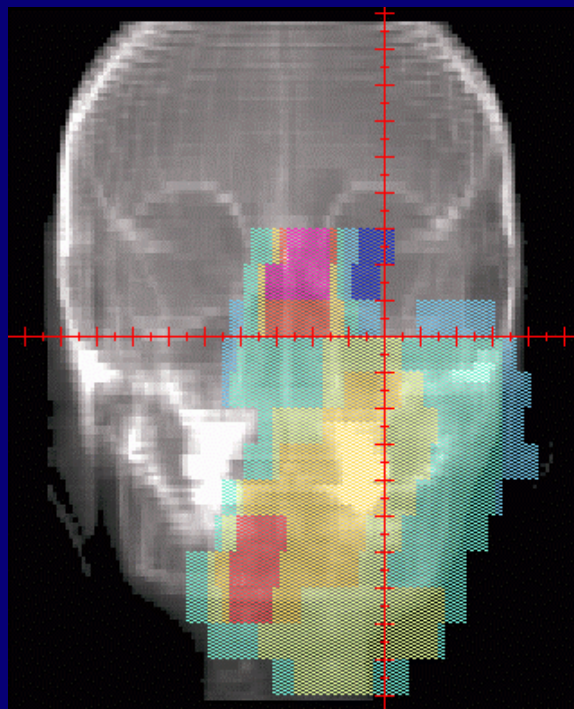
GTV

32 Gy

34 Gy

Problem 2: Proximity of the chiasm

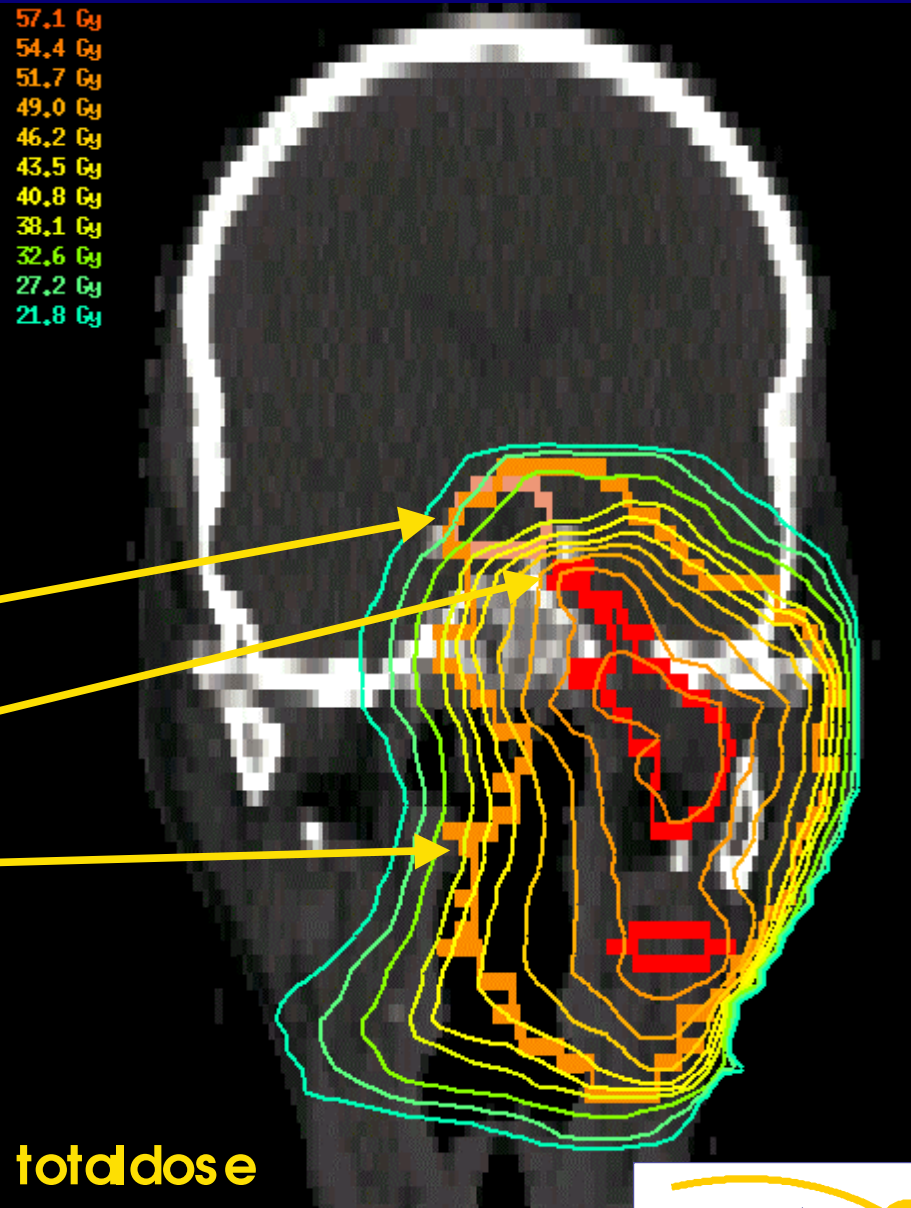
The chiasm was defined with a 3 mm margin for setup errors and dose reduction in the overlap area of chiasm and PTV was accepted



Chiasm

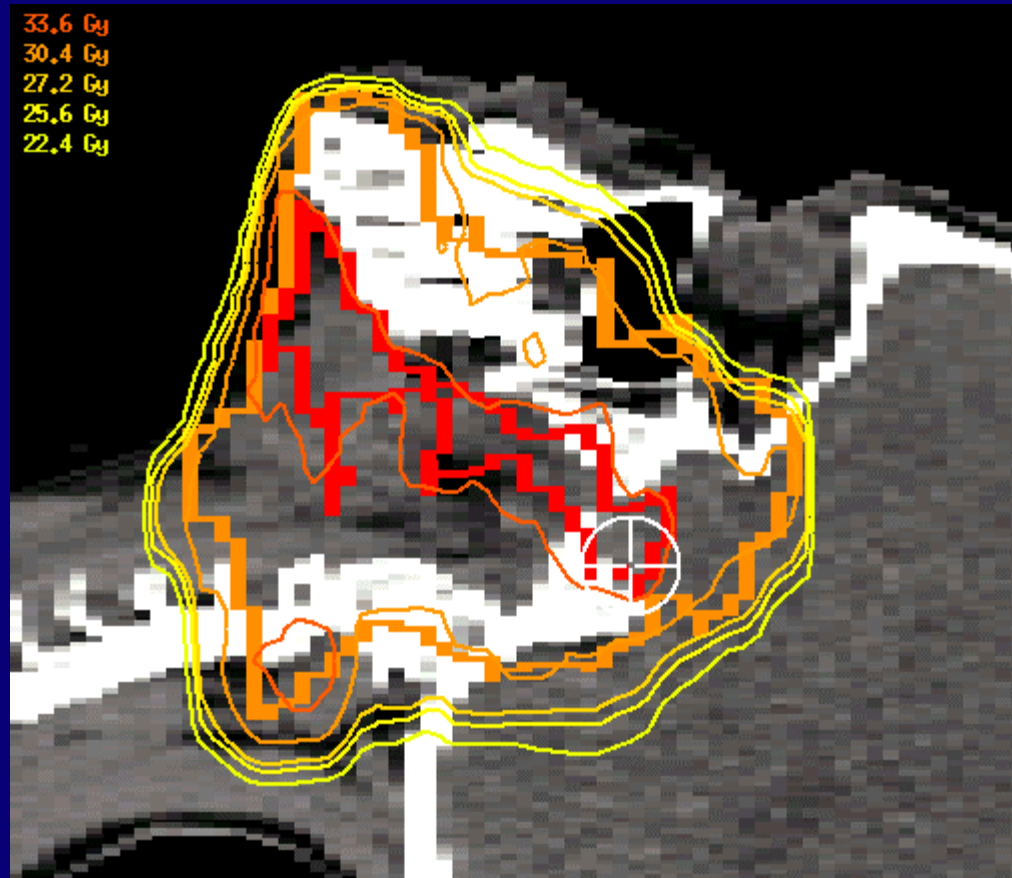
GTV

PTV



Problem 3: GTV close to skin surface

GTV extended close to skin at chin, but bolus should not be used if possible: exact surface dose computation required and inverse TPS has to extend fields for dose flash.



Final dose prescription

triple boost,
first 20 fractions 1.6 Gy to PTV,
followed by 8 fractions 1.6 Gy to CTV,
(20 + 8 + 4) x 1.7 Gy = 54.4 Gy to the GTV, (integrated boost)

Chiasm: EUD of 1st plan 30 Gy, of 1st and 2nd together 37 Gy,
total EUD 40 Gy. Optimisation takes into account already
delivered dose

Spinal cord: EUD of 1st plan 25 Gy, of 1st and 2nd together 29 Gy,
third boost was not relevant.

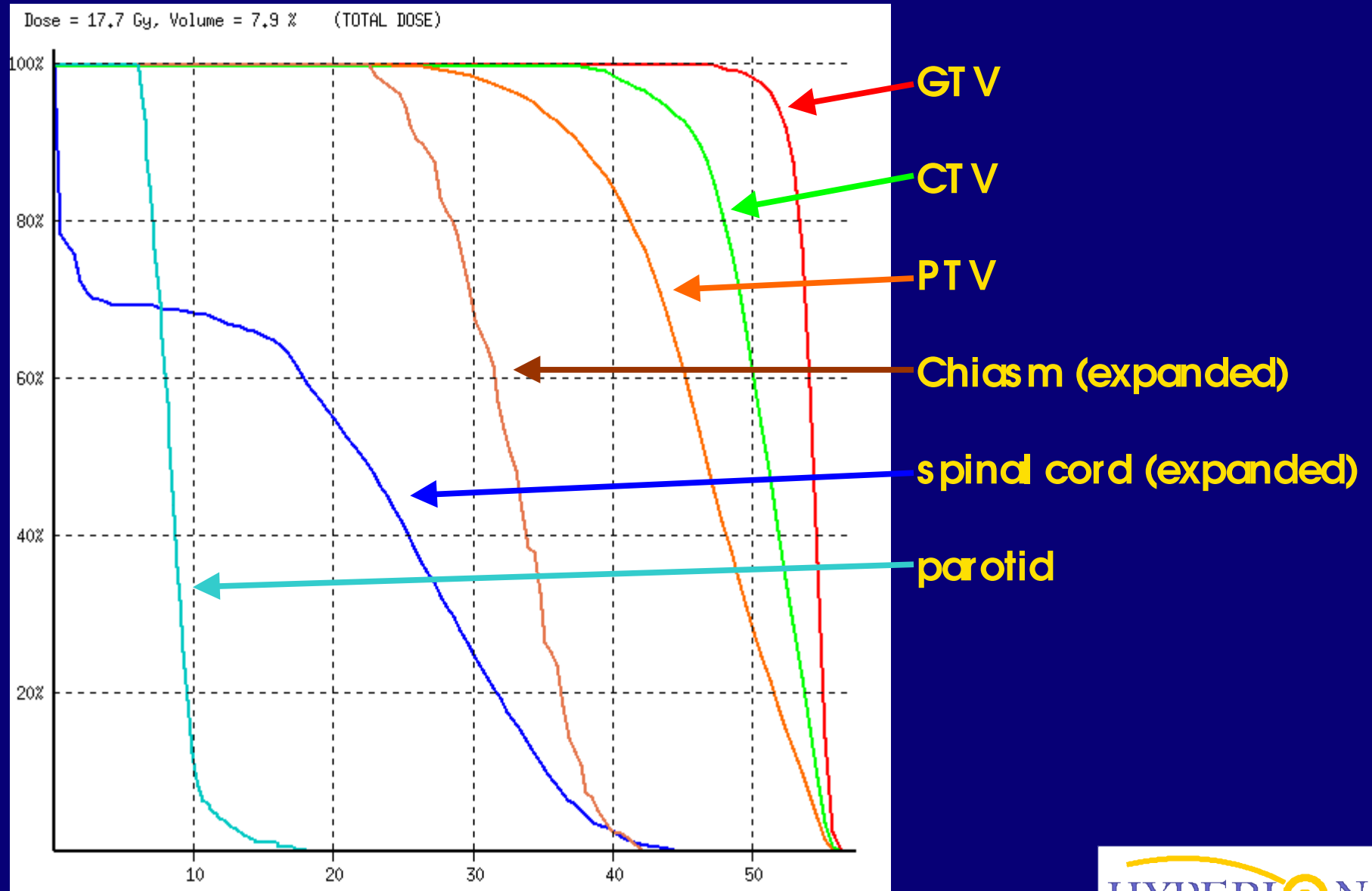
Maximum sparing of contralateral parotid (equivalent uniform
damage constraint), mean damage in total 10 per cent.

other organs considered: optical nerves, eyes, brain stem, brain,
mouth, rest of body...

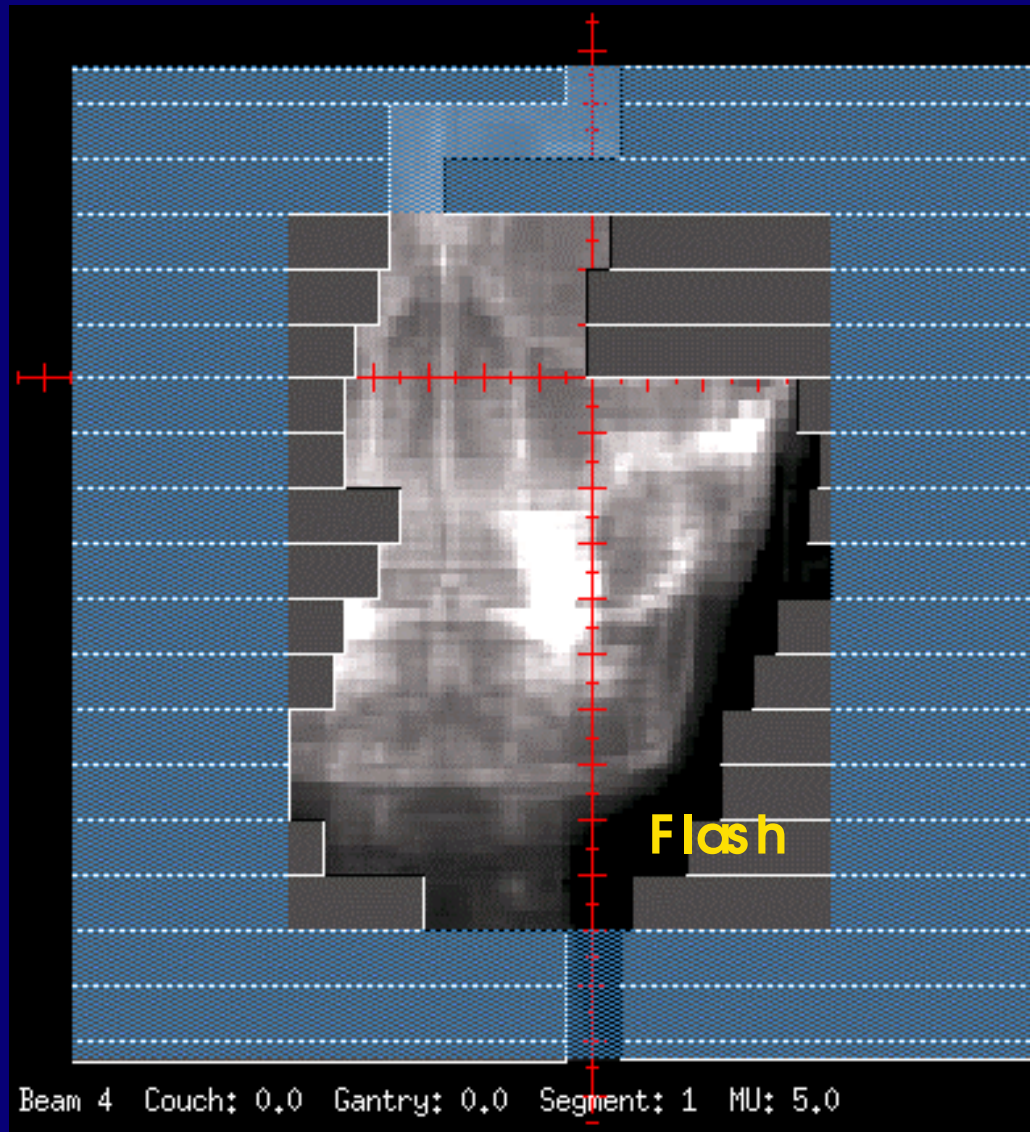
Details:

- Size of dose flash defined by a virtual target volume that extends into air at the chin
- Volume elements of TV close to surface have reduced weight in the cost function
- Dose computation for optimisation: Monte Carlo (XVMC)
- Inclusion of dose of daily portals, 2 MU per field
- 7 + 7 + 5 coplanar beams, directions hand optimized
- Resolution of dose grid: 2.5 mm
- Resolution of fluence grid: 2 mm x 10 mm
- Optimisation of segment shapes + weights for Elekta MLC
- Minimum Number of MU per segment: 3
- Minimum field size: 1 cm x 1 cm was required for GTV in vertebra!
- 67 + 53 + 35 Segments

A presentation feels better with a DVH.



**Dosimetry and Verification : none.
(Systematic errors of equipment exceed accuracy of Monte Carlo)**



... and segments make sense