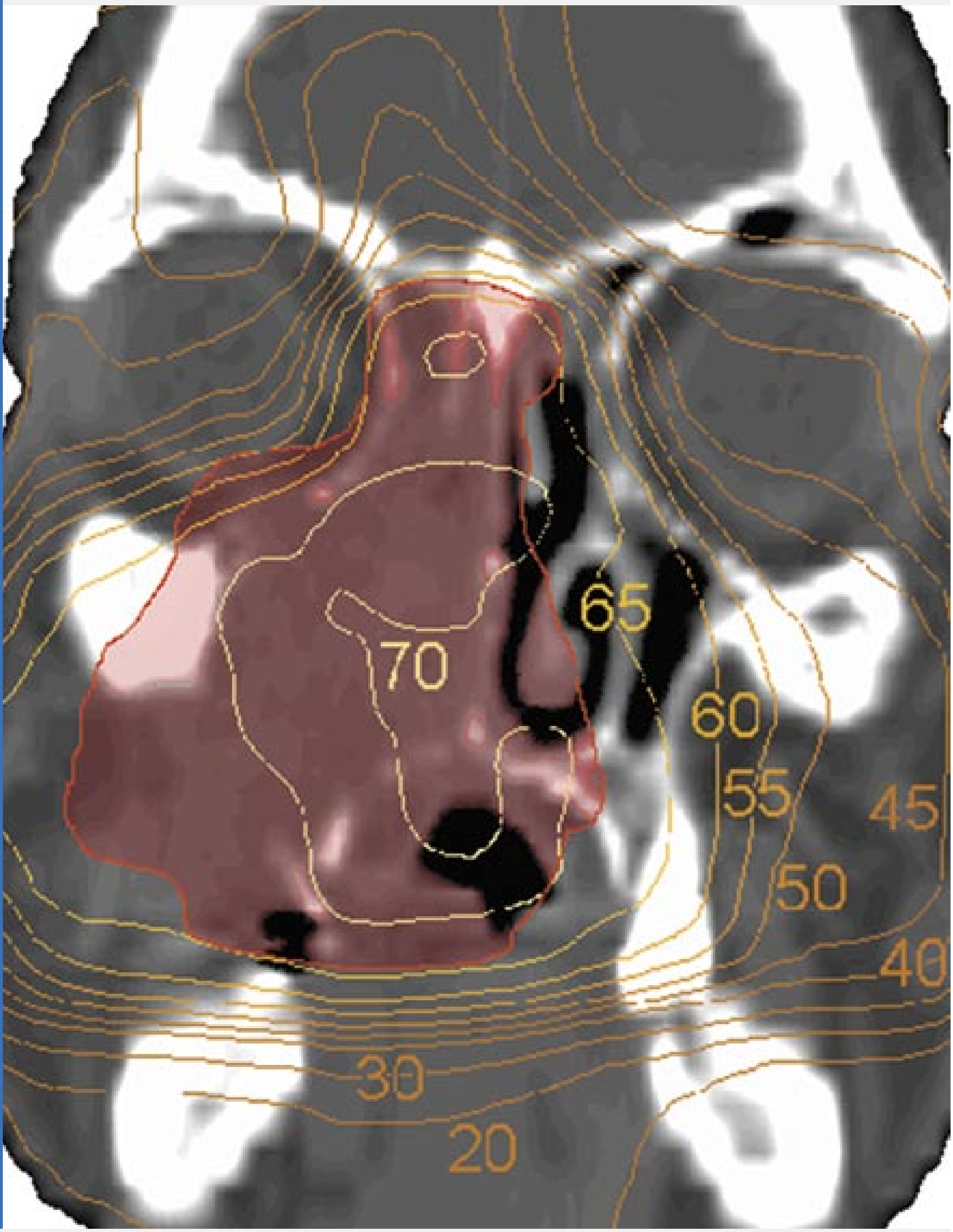
PRECISE RADIATION THERAPY

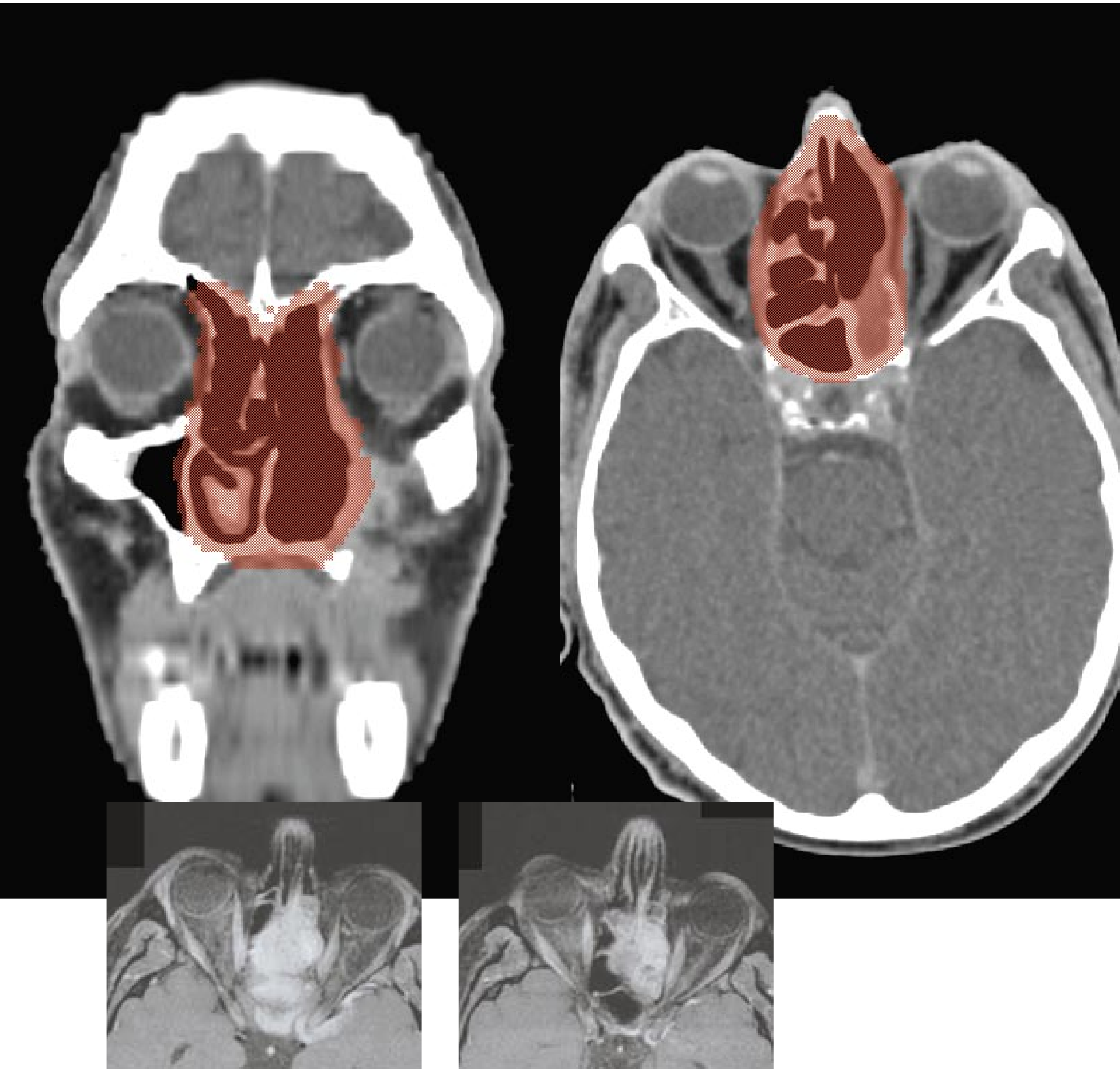
PreciseBEAM®



IMRT case study: ethmoid sinus
Ghent University Hospital

ELEKTA

IMRT class solution to spare binocular eyesigh



t

Goal

Intensity modulated radiation therapy (IMRT) class solution to spare binocular eyesight following radiation therapy treatment of ethmoid sinus cancer.

Methodology

11 patients with early- to late-stage ethmoid sinus cancer without regional lymph node metastasis were enrolled between February 1999 and July 2000. Treatment of these first patients resulted in the development of a standardized protocol used to treat subsequent patients. Delivery automation is based on two IMRT planning tools developed at Ghent University Hospital, Belgium, an anatomy-based segmentation tool (ABST) and a segment outline and weight adapting tool (SOWAT).

Implementation

A 3mm isotropic expansion margin was applied to the CTV to obtain the planning target volume (PTV). Set-up uncertainty in the organ(s) at risk (OAR) was accounted for by isotropically expanding these structures. The following table summarizes the PTV dose prescription and the OAR dose constraints. Dose parameters were based on published data for conventional radiation therapy.

PTV	
median dose 70 Gy (35 fract. x 2 Gy)	
maximal overdosage 7 % and 3D-Dmax located inside the PTV	
Organs at risk (OARs) constraints	Dmax (Gy)
optic chiasm (2 mm expanded)	60
optic nerve (2 mm expanded)	60
retina (2 mm expanded)	60
spinal cord (5 mm expanded)	50
brainstem (3 mm expanded)	60

Protocol implementation strategies

For the first patients an individualized approach was taken with the physician defining beam incidences and drawing segments using beams-eye-view (BEV) to create additional segments close to optical structures. An interactive optimization tool assigned segment weights to minimize doses to optic pathway structures and other OARs. This created desirable IMRT dose distributions but was too inefficient for routine planning. Therefore ABST and SOWAT tools were used to provide a guideline that could be used to implement a standardized protocol.

Anatomy-based approach

This solution generates a plan closely customized to the protocol constraints and within a predictable treatment time slot thereby maintaining patient flow. Defined by the class solution, ABST creates segments using BEV projection of the PTV and OAR structures for each of the seven beam incidences. The biophysical segment weight optimization tool (BP-SWOT) assigns weights to all segments. The segment shape and weights are optimized with those weighted 1MU or less deleted. Resultant DVHs are evaluated against the clinical protocol. Once the plan passes the protocol criteria, the segment delivery sequence is optimized and prescription files generated.

Conclusion

Preliminary results are promising but it is too soon to confirm the hypothesis that an IMRT solution will save binocular vision. However, the dry eye syndrome that afflicts 10% of patients after conventional radiation therapy has not been observed. This approach reduces the protocol translation time from a few days to about two hours. The IMRT planning tools allowed delivery of 20 to 37 segments within a 15 minute time slot or lesss.

Fighting serious disease

www.elekta.com

Stereotactic Neurosurgery ■ Gamma Knife® surgery ■ Functional Mapping ■ Precision Radiation Therapy ■ Image Guided Radiation Therapy ■ Stereotactic Radiation Therapy

Corporate Head Office
Stockholm, Sweden
Tel +46 8 587 254 00
Fax +46 8 587 255 00
info@elekta.com

Worldwide Product
Support Center
Tel +44 01293 654068
Fax +44 01293 654655
info.europe@elekta.com

North America
Atlanta, USA
Tel +1 770 300 9725
Fax +1 770 448 6338
info.america@elekta.com

Europe, South America,
Africa & the Middle East
Tel +44 1293 654068
Fax +44 1293 654655
info.europe@elekta.com

Japan
Kobe, Japan
Tel +81 78 241 7100
Fax +81 78 271 7823
info.japan@elekta.com

Asia Pacific
Hong Kong, China
Tel +852 2891 2208
Fax +852 2575 7133
info.asia@elekta.com