East of England Radiotherapy Network:

Penis Protocol V2.0

Contents

1.0 Indications and patient population

This protocol covers treatment in the following situations:

a. Radical radiotherapy

i. T1 or T2 lesions without nodal involvement.

ii. Locally advanced disease with fixed inguinal nodes.

iii. Medically unfit patients.

iv. Patients who refuse surgery.

b. Adjuvant radiotherapy

i. RT to lymph nodes can be considered, especially if the patient is not a candidate for adjuvant chemotherapy.

c. Palliative radiotherapy

i. Advanced inoperable primary tumours

ii. Fixed or fungating inguinal nodes

1.1 Curative treatment eligibility

1.1.a Inclusions

- Node-positive penile cancer with either:
    - Extracapsular extension
    - >3 lymph nodes involved moderately/ well differentiated
    - >1 lymph node involved poorly differentiated

1.1b Exclusions

- Distant metastases
- Poor performance status (KPS 3-4)

1.1c Essential Pre-Radiotherapy investigations for curative patients

- Contrast enhanced staging CT scans of the chest, abdomen, and pelvis or PET-CT
- MRI pelvis
- Endoscopic examination of the urethra and a cystoscopy
- Ultrasound to assess thickness of lesion, invasion of corpora, and any involved inguinal nodes
- Baseline serum Full Blood Count, Urea & Electrolytes, Liver Function tests and Squamous Cell Carcinoma Antigen (SCCAg)

2.0 Localisation

Localisation	Options	Notes
Position	Supine	
Arm position	Across chest	Comfortable reproducible position
Immobilisation and supports	Leg and ankle immobilisation	Used as appropriate
	Additional immobilisation as required	Mould room advice may be needed following the discussion during the preplanning meeting.
Organ pre-requisites	Standard prostate bladder filling protocol where possible	
Contrast	IV contrast	If appropriate, renal function is acceptable and venous access is possible.
CT acquisition	Slice thickness:	2- 3mm
	Scanning limits	Upper limit: top of L5 (top of L3 for patients requiring common iliac treatment) Lower limit – lower limit of any surgical scar or mid-thigh, whichever is lower. The scrotum must be fully cleared.

3.0 Dose prescription & chemotherapy

Intent		Dose (Gy)/#	#/ week	Planning technique/ further comment
External Beam Radiotherapy		60Gy/ 30#	5	
		64Gy/ 32#	5	
		66Gy/ 33#	5	
		57Gy/ 25#	5	
		50Gy/ 25#	5	To the whole pelvis and involved inguinal regions
		54Gy/ 25#	5	
		50.4Gy/ 28#	5	
		50Gy/ 16#	5	
		55Gy/ 20#	5	
		45Gy/ 25#	5	
Brachytherapy	HDR Mould	38.4Gy /12#	Twice daily in 6 days	Minimum 6 hours between fractions.
	Interstitial	65Gy	1	To 85% isodose
Palliative radiotherapy		21Gy/ 3#	1	

4.0 Target volumes

- Use standard nomenclature as per AAPM 263
- https://www.aapm.org/pubs/reports/RPT_263.pdf
- Target volumes should match agreed naming conventions unless there are operational reasons for use of other naming. PTV ProKnow nomenclature should be used for NHSE ProKnow Collections and Scorecard Templates for upload.

4.1 Electron

Visible tumour with 2cm margin. Treat with customised lead cut out with bolus to ensure >95% surface dose.

4.2 Brachytherapy

Mould: two Perspex cylinders with the outer one loaded with Ir^{192}. HDR brachytherapy can be used instead.

Interstitial: The target volume is the tumour with a 1-2cm margin. Radioactive implants inserted under GA according to Paris guidelines (implants inserted perpendicular to the penis in one or two planes separated by 2- 3cm; the source separation is approximately 12-15mm). a 2cm lead shield posterior to the penis will prevent the dose to the testes.

4.3 External Beam Radiotherapy

GTV/CTV

- Macroscopic nodal disease contoured as GTV_I for the inguinal region and GTV_P for the pelvis.
- CTV_I and CTV_P = GTV_I/P + 5 mm
- Macroscopic disease within pre-pubic fat contoured as GTV_I and expanded by 5 mm as part of CTV_I if present.
- CTV nodes should be edited from natural barriers

N.B. Boundary nodes traversing slices sup and inf to femoral head should be contoured as GTV_P.

The selection of the appropriate dose for each nodal region should be considered separately and as such there are as six different anatomical volumes:

- CTV_Pelvis_R .(External iliac, internal iliac, obturator nodal groups)
- CTV_Pelvis_L .(External iliac, internal iliac, obturator nodal groups)
- CTV_Commoniliac
- CTV_Inguinal_R
- CTV_Inguinal_L
- CTV_Prepubicfat

N.B. the inclusion of whole/part of seromas, surgical clips, surgical scar and scar tissue is at the discretion of the clinician.

PTV

- CTV + 5-8 mm

4.4 Palliative radiotherapy

Visible tumour with a 1.5 – 2cm margin.

5.0 Organs at risk

- Aim for the use of standard nomenclature as per Global Harmonization Group consensus guidelines: https://www.thegreenjournal.com/action/showPdf?pii=S0167-8140%2820%2930294-2

5.1 Target dose objectives

	PTV_5700 (boost)		PTV_5400		PTV_4500	
	Mandatory	**Optimal (PlanPTV)**	**Mandatory**	**Optimal (PlanPTV)**	**Mandatory**	**Optimal (PlanPTV)**
D99%	≥90%	≥95%	≥90%	≥95%	≥90%	≥95%
D98%	Unspecified but must be reported		Unspecified but must be reported		Unspecified but must be reported	
D95%	≥95%	≥98%	≥95%	≥98%	≥95%	≥98%
D50%	=100% ± 1Gy	=100% ± 1Gy	=100% ± 1Gy	=100% ± 1Gy	=100% ± 1Gy	=100% ± 1Gy
D5%	≤105%	≤105%	≤105%	≤105%	≤105% (not applicable if higher dose PTVs present)	≤105% (not applicable if higher dose PTVs present)
D2%	≤107%	≤107%	≤107%	≤107%	≤107% (not applicable if higher dose PTVs present)	≤107% (not applicable if higher dose PTVs present)

5.2 Constraints

Structure name	Constraint	Optimal	Mandatory
Rectum	V28Gy V36Gy V45Gy V54Gy	<80% <65% <50% <35%	- - <60% <50%

Structure name	Constraint	Optimal	Mandatory
Bladder	V45Gy V54Gy	<50% <25%	- -
BowelBag	V41Gy V45Gy V50Gy V54Gy	<78cc <17cc <14cc <0.5cc	<158cc <110cc <28cc <6cc
FemoralHeadNeck_R and FemoralHeadNeck_L	V50Gy	-	<50%

6.0 Planning process/ technique

3D/ VMAT planning

Electrons

Brachytherapy

7.0 Peer Review/ Contour QA

- All radical volumes should be prospectively peer reviewed before the start of treatment.
- A description of the contouring (planning note) and of the peer review process including changes made should be saved in the patient record.
- The peer review process and outcomes should be audited.

8.0 Target verification

Modality	Frequency	Match point	Additional information
kV planar/ MV planar/ CBCT	Daily CBCT. Daily kV images if CBCT not possible	Bone match to PTV	

9.0 Side effects

9.1 Possible early or short-term side effects	
	Initial management (if appropriate)
Tiredness	Rest when required Light exercise
Skin soreness, itching and colour changes in treatment area	E45 cream, hydrocortisone cream, patient's current moisturiser as long as it is Sodium Lauryl Sulphate (SLS) free.
Prepuce oedema	
Local infection	
Dysuria	
Difficulty with micturition	

9.2 Possible late or long – term side effects	
	Initial management (if appropriate)
Ongoing fatigue	Assess for reversible causes (e.g. anaemia), exercise advice
Telangiectasia	
Superficial necrosis of the glans	
Stenosis of the urethral meatus	

9.2 Possible late or long – term side effects	
	Initial management (if appropriate)
Urinary symptoms including: frequency; urgency; incontinence; haematuria	Follow: Best Practice Pathway for Pelvic Radiation Disease – Urinary. Consider referral to late effects service, if available. Supportive devices such as incontinence pads and/or underwear. Pelvic floor exercises (squeezy app, physio referral). Bladder retraining. Lifestyle modifications, fluid management, avoid irritants, health diet, healthy weight. Consider referral to incontinence team and or urology. Consider psychological support.
Difficulty getting an erection/ Pain during sexual intercourse	Consider oral medication: Sildenafil/ Tadalafil. If unsuccessful following trial of above medications referral to andrology. Consider referral for psychosexual support. Practical support including devices such as onut.
Lymphoedema of legs	Referral to lymphoedema service. Consider compression bandages, skin care, exercises to use affected muscles to improve lymph drainage and manual lymphatic drainage.

10.0 References

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11.0 Members of the protocol drafting committee

Mid and South Essex NHS Foundation Trust: Dr Steve Nicholson, Rachel Persaud

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12.0 Amendment History

A record of changes in this document

Date	Updated version number	Previous version number	Page Number/ Section (updated version)	Details
04.25	V1.0			New Document
	V2.0	V1.0	Section 10	References updated
			Section 4	Target volume information updated