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FROM THE GYNECOLOGIC SECTION, DEPARTMENT OF ONCOLOGY AND THE DEPARTMENT OF RADIATION PHYSICS, UNIVERSITY HOSPITAL, S-221 85 LUND, SWEDEN.

RADIATION THERAPY AND SURGERY IN THE TREATMENT OF REGIONAL LYMPH NODES IN SQUAMOUS CELL CARCINOMA OF THE VULVA

E. SIMONSEN, U.-B. NORDBERG, J.-E. JOHNSSON, I.-L. LAMM and C. TROPÉ

Abstract

A series of 244 patients with vulvar squamous cell carcinomas was analyzed with regard to treatment of the regional lymph nodes. In 144 patients, groin dissection was performed, supplemented in 24 cases by pelvic lymphadenectomy. Preoperative irradiation was given and in cases with positive nodes postoperative irradiation as well. Patients in whom lymph node dissection was not performed received irradiation. Treatment failures in the regional lymph node regions were analyzed and the policy concerning treatment of the regional lymph nodes is discussed.

The regional lymph nodes are treated in many therapeutic schedules for malignant diseases. TAUSSIG (22) and WAY (23, 25) described surgical treatment of the regional lymph nodes in connection with vulvar carcinoma and their technique has become the usual measure at radical vulvectomy. Due to the relatively high morbidity and even some mortality following surgery, other methods of treating the regional lymph nodes have been suggested. EDSMYR (5), DALY & MILLION (4) and HAMBERGER & WHARTON (8) used irradiation adjuvantly. WEGHAUPT (27) and KUCERA (12) also used irradiation when inguinal metastases were demonstrated.

In this report, results of combined irradiation and surgery for treating the regional lymph nodes are presented and the principles for their treatment are discussed.

Material and Methods

The material consisted of 244 patients with squamous cell carcinoma of the vulva treated at this hospital between 1962 and 1979.

The staging according to the FIGO system and classification of the regional lymph nodes in the different stages using the TNM system (UICC) appear in Table 1. No regional metastases were suggested in 66 per cent, while in 34 per cent such metastases were demonstrated clinically or considered possible. Fine needle biopsy of the inguinal lymph nodes was as a rule not done.

Treatment of the primary tumour consisted of radical vulvectomy with the warm knife and open wound technique. The regional lymph nodes were operated upon by groin dissection in 114 cases, in 24 of these by pelvic lymphadenectomy as well, Surgery was as a rule carried out on two separate occasions, with groin dissection and lymphadenectomy six weeks after the vulvectomy. The surgical technique has been described in detail in previous reports (20, 21).

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Table 1
Classification according to FIGO and UICC

FIGO	TNM			
	N0	N1	N2	N3
Stage I	72	7	–	–
Stage II	51	11	3	–
Stage III	15	3	46	–
Stage IV	–	1	8	27
Total	160 (66%)		84 (34%)	

Table 2
Radiologic treatment of the inguinal regions in 244 patients with vulvar carcinoma

Treatment	Primary target	Primary and secondary target	Total
Solely preoperative	71	–	71
Preoperative and postoperative	17	23	40
Solely postoperative	1	2	3
Irradiation alone	85	12	97
Not treated	–	–	33
Total	174	37	244

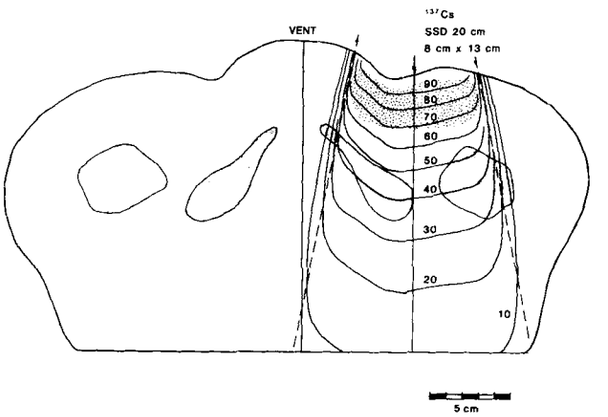

Fig. 1. Treatment planning for the inguinal lymph nodes (primary target) using single beam therapy (^{137}Cs).

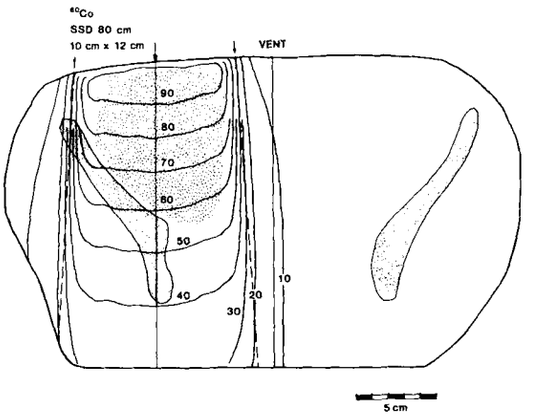

Fig. 2. Treatment planning for inguinal, external iliac and interiliac lymph nodes (primary and secondary target) using single beam therapy (^{60}Co).

Radiologic treatment of the regional lymph nodes was given both preoperatively and postoperatively; some patients received only radiation therapy (Table 2).

Preoperative radiologic treatment. Irradiation was given preoperatively in connection with vulvectomy. The target included the inguinal lymph node regions. The deepest part of these was assumed to be located 3 cm below the skin surface. A ^{137}Cs unit was used with a single-field technique, a field size of 8 cm × 13 cm and an SSD of 20 cm (Fig. 1). The peak absorbed dose was 7 Gy per fraction with 3 fractions a week and a total dose of 21 Gy. This gave a specification dose of 17.6 Gy in a point on the central axis of the field at the centre of the target volume at 1.5 cm depth. The dose in the target then varied from 15 to 21 Gy. Of the 114 patients given groin dissection, 111 also received preoperative irradiation.

Postoperative irradiation. Patients in whom malignancy was demonstrated in the surgical specimens received as a rule supplementary irradiation towards one or both groins. The primary target included the operation area, which was defined in the same way as the inguinal lymph node regions. Eighteen patients (42%, including one patient not given preoperative treatment) of a total of 43 were given postoperative irradiation to the primary target alone.

During recent years, the target volume has been enlarged to include the external and interiliacal lymph node regions in the small pelvis (secondary target). The deepest part of these nodes was assumed to be located 10 cm below the surface of the skin. The specification point of the secondary target volume was defined as the centre of the target, i.e. at 5 cm depth. The absorbed dose of the total target volume, including both primary and secondary target, was specified at the centre point of the total target, i.e. at 5 cm depth. Twenty-five (58%) of 43

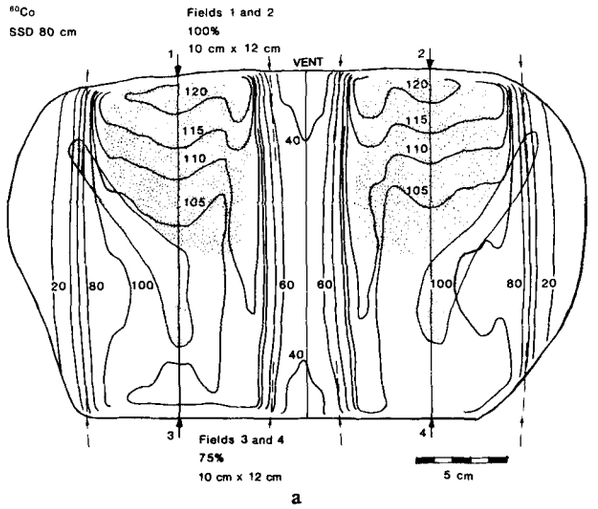

Fig. 3. a) Treatment planning for inguinal, external iliac and interiliac lymph nodes (primary and secondary target) using two opposed weighted beams. b) The caudal part of the posterior field has a different weight.

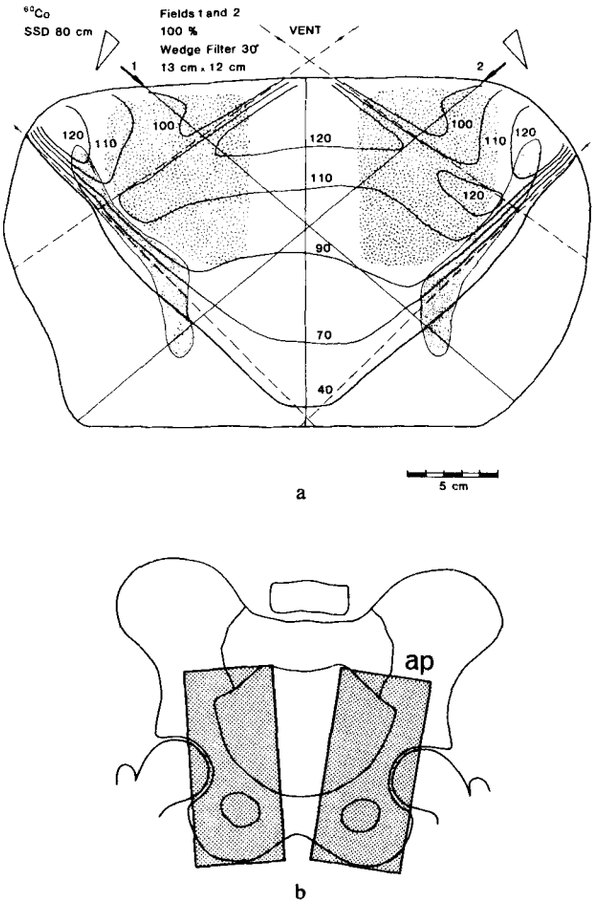

Fig. 4. Treatment planning for inguinal, external iliac and interiliac lymph nodes (primary and secondary target) using two medially angled fields with wedge filters.

patients, including 2 not given preoperative irradiation, were irradiated postoperatively both to the primary and the secondary target.

When only the primary target was treated postoperatively, a ^{137}Cs unit was used, with the same SSD and field size as described for the preoperative treatment. The peak absorbed dose was 3 Gy per fraction, 5 fractions a week were given, and the specification dose varied from 10.1 Gy to 35.5 Gy, with a variation within the target of 8.5 to 12 Gy, to 30 to 42 Gy, respectively.

The postoperative treatment was started during the first ten days after operation, and as a rule a specification dose of 10.1 Gy (4 fractions) was given. After 3 to 5 weeks, the additional irradiation was delivered.

When both targets were treated postoperatively, a ^{60}Co unit and a single-field technique was used with SSD 80 cm and a field size of about 150 cm^2 (Fig. 2). The peak absorbed dose was 3 Gy per fraction, 5 fractions a week. The specification dose varied from 9.6 Gy to 33.6 Gy with a variation within the target from 6.8 to 12 Gy, to 24 to 42 Gy, respectively.

The postoperative treatment was started during the first ten days after operation, and as a rule a specification dose of about 9.6 Gy (4 fractions) was given, using a bolus over the wound area to compensate for the build up effect. After 3 to 5 weeks, the additional irradiation was given. In 3 patients, two medially angled fields with wedge filters were used, with a target absorbed dose for both the primary and the secondary target of (20.4±10%) Gy, (37±11%) Gy and (39±5%) Gy, respectively. This technique is described in the next section.

Irradiation alone. A total of 97 patients were judged as being too frail for lymph node evacuation,

Table 3
CRE values for the treatment of inguinal and pelvic lymph node regions in 208 patients

Treatment	No. of patients	CRE	
		Primary target Inguinal lymph nodes	Secondary target Pelvic lymph nodes
Preoperative irradiation only	71	11	
Pre- and postoperative irradiation	17	11–12	
	18	12–13	9–10
	3	15	11–12
	2	17	14
Irradiation alone	51	11	
	12	12–14	
	22	15–16	
	5		11–12
	7		>12–14

Table 4
Results of histopathologic analysis following lymphadenectomy in 114 patients

TNM	No. of patients	Groin dissection			No. of patients	Pelvic dissection		
		No carcinoma	Carcinoma in lymph nodes	Carcinoma outside lymph nodes		No carcinoma	Carcinoma in lymph nodes	Carcinoma outside lymph nodes
N0–N1	70	46	10	14	8	6	–	2
N2–N3	44	10	9	25	16	7	1	8

or they refused surgery. They were given radiation therapy alone and in 85 of these only the primary target was treated. The technique and fractionation were the same as described for preoperative treatment. A specification dose varying from 17.6 Gy to 23.5 Gy was given in the first series in connection with vulvectomy. Fifty-one patients received no further treatment. The other 34 patients were treated with a second series about 3 weeks later, with a peak absorbed dose of 3 Gy per fraction, 5 fractions a week. The total specification dose varied from 27.7 Gy to 42.8 Gy.

Both targets were treated in 12 patients. A ^{60}Co unit and a single-field technique was used. The SSD was 80 cm, and the field size about 150 cm^2. The peak absorbed dose was 3 Gy per fraction, with 5 fractions a week. The specification dose for the secondary target varied from 28.8 Gy to 41.6 Gy. As a rule, the treatment was given in two series, 3 weeks apart, with 16 Gy to 24 Gy in the first series.

Four patients were treated with more complicated techniques using either weighted, opposed anterior-posterior fields or two anterior angled fields with wedge filters. A ^{60}Co unit was used (Figs 3, 4). Two of these patients received an absorbed dose to the total target of about 30 Gy in one series and the other 2 patients about 60 Gy given in two series. Five fractions per week were given with a daily peak absorbed dose of 3 Gy.

Thirty-three patients received no treatment of the inguinal lymph nodes, usually because of small primary tumours with little risk for spreading to the regional lymph nodes.

The radiologic technique used varied as regards photon energies and pattern at fractionation. CRE values were calculated according to KIRK et coll. (1971) and are given in Table 3.

In the following presentation the findings at lymph node evacuation are reported in relation to the preoperative status of the nodes. The regional metastases were recorded if they constituted the only treatment failure in the patient or if they oc-

Table 5
Number of metastases after conclusion of treatment among 114 patients

TNM	Total No. of metastases / Total No. of patients	No treatment	Irradiation alone	Irradiation and lymphadenectomy
N0–N1	20/160 (13%)	2/25	11/65	7/70
N2–N3	30/84 (36%)	2/8	8/32	20/44

Table 6
Results of histopathologic analysis, number of regional treatment failures and CRE values in 111 patients given pre- and postoperative irradiation

Treatment	No. of patients	CRE in primary target	CRE in secondary target	No. of metastases/No. of patients		
				No carcinoma	Carcinoma in lymph nodes	Carcinoma outside lymph nodes
Preoperative irradiation	71	11		3/56	2/7	3/8
Pre- and postoperative irradiation	17	11			0/4	5/13
	18	12–13	9–10		2/7	8/11
	3	14–15	11–12		1/1	2/2
	2	17	14		0/0	0/2
Total				3/56	5/19	18/36

Table 7
Regional treatment failures and CRE values for patients who only received irradiation

CRE in primary target	CRE in secondary target	No. of metastases/ No. of patients
11		7/51
12–14		3/12
15–16		5/22
	11–12	2/5
	>12–14	2/7
Total		19/97 (20%)

curred together with local recurrences. They are reported in relation to the preoperative lymph node status, to the type of treatment and the surgical findings, and to the radiation therapy given.

Complications in the form of leg oedema requiring treatment with diuretics and bandaging, and thromboses during and following treatment, are reported. These conditions were not recorded, however, when they occurred in connection with metastases. The patients were observed for periods varying from 2 to 17 years.

Results

No clinical suggestion of regional metastases existed for 160 patients (N0–N1). Among these, groin dissection was performed in 70 cases, 8 of whom also underwent pelvic lymphadenectomy. Table 4 shows the histopathologic findings at surgery. Metastases in the regional lymph nodes were found in 24 of 70 patients (34%) without clinical signs of lymph node metastases.

Suggested or clinically demonstrated metastases were recorded in 84 patients (N2–N3), 44 of whom had undergone groin dissection. Sixteen of these patients also underwent pelvic lymphadenectomy. Table 4 shows the histopathologic findings. In 10 of 44 patients (22%) no metastases in the regional lymph nodes were found, though this had been suggested at clinical examination. The metastases in the lymph nodes found after completion of treatment appear in Table 5, according to treatment group.

Table 6 shows the radiologic treatment expressed in CRE values, in the different groups given lymphadenectomy, as well as the regional treatment failures observed. Higher radiation doses were given in patients with perinodular growth, especially when surgery had not been macroscopically radical. The

Table 8

Results of histopathologic analysis following pelvic lymphadenectomy in 111 patients given preoperative irradiation

No. of patients	Groin dissection			Pelvic dissection		
	No carcinoma	Carcinoma in lymph nodes	Carcinoma outside lymph nodes	No carcinoma	Carcinoma in lymph nodes	Carcinoma outside lymph nodes
2	2	–	–	2	–	–
6	–	6	–	6	–	–
1*	–	1	–	–	1	–
5*	–	–	5	5	–	–
10**	–	–	10	–	–	10
24	2	7	15	13	1	10

* One regional treatment failure.
** Five regional treatment failures.

secondary target was also treated if the tumour growth was extensive. The different treatment groups are, however, not comparable and it is thus not possible to evaluate the effectiveness of the different radiation doses.

The CRE values in cases where only irradiation of the regional lymh nodes was given and the regional treatment failures recorded are shown in Table 7. This group also received treatment of the secondary target and higher radiation doses were given when an extensive tumour in the regional lymph nodes was present. No evaluation of the effectiveness of the radiation doses could be made in this group, either.

Regional treatment failures were found in 3 of the 56 patients in whom no metastases could be demonstrated in the excised lymph nodes; 5 of 19 patients with carcinoma in the lymph nodes had regional treatment failures and as many as 18 of 36 patients with perinodular growth (Table 6).

Table 8 gives the histopathologic findings in the inguinal and pelvic lymph nodes at lymphadenectomy in the pelvis and the regional treatment failures. In the 24 patients in whom pelvic lymphadenectomy was performed, regional treatment failures were recorded in 7 cases. These were in all 7 cases localized in both the inguinal and pelvic sites of surgery.

Of the 87 patients who underwent groin dissection 19 developed regional metastases. In 15 of these, the metastases probably occurred in the pelvic site of surgery (4 cases) or in both the pelvic and the inguinal site of surgery. Only 4 of these patients had metastases confined to the inguinal site of surgery. Of the 97 patients (20%) who received irradiation only to the regional lymph nodes 19 developed regional metastases later. These were in 10 cases localized to pelvic or to both inguinal and pelvic lymph nodes.

No case of leg oedema or thrombosis was recorded among the patients who only received radiologic treatment of the inguinal and pelvic regions. Leg oedema was recorded in 5 of the 24 patients (about 21%) in whom pelvic lymphadenectomy was performed. The corresponding figure for the group with groin dissection alone was 12 of 90 patients (13%). Thrombosis was observed in 7 of 114 patients (6%), 3 of whom also showed signs of pulmonary embolism. Infected wounds requiring treatment with antibiotics were recorded in 12 of 114 patients (11%). No skin necrosis was seen, nor was there any pre- or postoperative mortality.

Discussion

It is very hard to evaluate tumour growth in inguinal lymph nodes clinically. Most reports give figures of 16 to 39 per cent for metastases found at groin dissection in patients thought to have normal or benignly affected lymph nodes (N0–N1) (4, 13, 16, 25). This agrees well with the rate for the present material, which was 34 per cent.

It is also hard to evaluate abnormal inguinal lymph nodes. In the patients who had clinically

obvious or suggested metastases (N2–N3), 22 per cent had no evidence of metastases at lymphadenectomy. Other centres have reported similar experience (5, 13, 16, 25).

Nevertheless, clinical evaluation of the inguinal lymph nodes generally gives relatively good information on the tumour growth in the nodes. This is supported by the fact that regional treatment failures were observed in 10 per cent of the patients who underwent lymphadenectomy in the N0–N1 group, while 45 per cent of the N2–N3 group had regional treatment failures. It is, however, probable that greater accuracy could be attained in the preoperative evaluation if fine needle biopsy were performed as a clinical routine.

Bilateral lymphadenectomy has been recommended during the past decades, because of the risk of metastases in the contralateral lymph nodes, also when the tumour is one-sided (16, 26). No isolated contralateral metastases were observed in the present material, however, and tumours of the clitoral region did not show an increased frequency of metastases to the pelvic nodes. One-sided tumours not situated near the midline ought to be satisfactorily treated by ipsilateral inguinal lymphadenectomy. If metastases are found, it seems wise to treat the contralateral inguinal region surgically as well. Opinions differ as to whether or not pelvic lymphadenectomy should be performed in connection with inguinal lymphadenectomy, and in what situations this may be warranted. Some authors consider that pelvic lymphadenectomy should be performed as a routine at lymph node evacuation (18, 23). Others perform a histopathologic examination of the excised nodes at surgery. Only if the inguinal nodes show malignancy is the operation then supplemented by pelvic lymphadenectomy (24). Metastases in the pelvic nodes without metastases in the inguinal nodes are very rare, and pelvic lymphadenectomy is therefore not motivated when the inguinal nodes are normal (2, 9, 14).

Half of the patients who underwent lymphadenectomy had no malignancy in the excised lymph nodes. Five per cent of these developed regional metastases during the observation period. LUNDWALL (13) and EDSMYR (5) have reported similar figures. It is not possible to ascertain whether this finding was due to an inadequate technique at lymphadenectomy, or whether metastases were overlooked at the original routine histopathologic examination (13).

The patients in whom malignancy was demonstrated in the excised nodes had a higher frequency of regional treatment failures. This was mostly seen in cases where tumour growth was demonstrated outside the capsule of the node (about 50%). Not many reports have appeared on regional treatment failures after treatment of the lymph node regions. LUNDWALL (13), however, reported a similar frequency of metastases in a material of 39 patients; local recurrences were, however, also included.

The surgical findings and frequencies of metastases discussed include the 24 patients who underwent pelvic lymphadenectomy. No malignancy was observed in the pelvic lymph nodes in any of these patients except when this was also present in the inguinal lymph nodes.

Pelvic lymphadenectomy was as a rule not performed in this material, except when clinically suggested or confirmed metastases were found in the inguinal regions. This explains the relatively high frequency of metastases (11/24). PLENTL & FRIEDMAN (16) stated that 'about one-third of patients with any positive nodes have pelvic nodes involvement'.

Regional treatment failures occurred in 5 of the 10 patients who had perinodular growth in the excised pelvic nodes. This is a rather low frequency. It is not possible to evaluate the effect of irradiation in this connection. It may be difficult, clinically, to determine the exact localization of a lymph node relapse in the inguinal or pelvic regions. In all patients who underwent pelvic lymphadenectomy the metastases were recorded as localized to both the inguinal and pelvic areas.

Metastases in the pelvic region also dominated in those patients who only underwent groin dissection, while about half of the patients given irradiation of the regional lymph node regions developed pelvic metastases.

Radiation therapy was, with only a few exceptions, given preoperatively in connection with lymphadenectomy. Postoperative treatment was, as a rule, given only if malignancy was demonstrated in lymph nodes or if non-resectable lymph node metastases were found. Opinions differ as to whether irradiation should be given pre- or postoperatively (8, 15). Preoperative therapy was considered advantageous for the following reasons. Most patients are old, and it can be determined at vulvectomy whether lymphadenectomy is suitable. If unsuitable the preoperative radiation therapy can be the first irra-

diation series, which can then be supplemented by a second course and constitute the only treatment of the regional lymph nodes.

The photon energy used (gamma radiation from a ^{137}Cs unit) had, with the single-field technique, a variation of the absorbed dose in the primary target in relation to the specification dose, of ±17 per cent, which was regarded as acceptable. Gamma radiation from a ^{60}Co unit with single-field technique was, as a rule, used when the external and interiliac lymph nodes were also treated. This technique gave only negligible variations of the absorbed radiation dose in the primary target, but in the secondary target the variation was ±27 per cent in relation to the specification dose, which was not satisfactory.

In order to achieve more even distribution of the absorbed radiation dose in the target, two different techniques were used in a few patients. Both techniques utilized a ^{60}Co unit. In one of them, two medially angled fields with a wedge filter were used. This method gave a satisfactory dose distribution in the target, with a variation of ±(5%–11%). The patient, however, received rather high radiation doses in a relatively large volume of non-tumourous tissue; hot spots occurred laterally in the subcutaneous tissue in some patients. This in turn caused poor healing after lymphadenectomy and pronounced subcutaneous fibrosis. One patient, who had received a total specification dose of 50.1 Gy in the primary target, developed repeated small ulcerations in the inguinal skin during the follow-up period.

The other technique used two opposing fields. This technique gave satisfactory dose distribution in the target, with a variation of ±(5%–10%), and low radiation doses to surrounding tissues. This technique agreed quite well with that described by DALY & MILLION (4) and HAMBERGER & WHARTON (8), and is probably the most suitable method at present for the radiologic treatment of inguinal and pelvic lymph nodes postoperatively or when irradiation constitutes the only treatment.

The irradiation technique also varied with respect to the fractionation pattern. For this reason CRE values according to KIRK et coll. (11) were calculated. Most radiation therapy centres consider the CRE value for normal connective tissue tolerance to be about 19.0.

The preoperative radiation dose used was about the same as that used by the department for preoperative irradiation of the whole true pelvis. The dose was thus rater low, considering the treatment volume, which contains no critical organs. SCHULTZ et coll. (19) used a 'tumour dose' of 45 Gy and HAMBERGER & WHARTON (8) used 45 to 50 Gy for treating the inguinal and external iliac areas, with a fractionation of 2 Gy per day, 5 fractions a week, which corresponds to a CRE value of 14 to 16. ACOSTA et coll. (1) used 50 to 55 Gy from a ^{60}Co unit and single-field technique with the same fractionation scheme as that described above. JAFARI & MAGALOTTI (10) used 30 to 60 Gy preoperatively to the inguinal regions in cases of stage III and IV tumours.

The postoperative radiation doses in patients with positive lymph nodes were unsatisfactorily low in the present series. HAMBERGER & WHARTON (8) state that 'a minimum of 50 Gy tumour dose' to all areas, using the previously described fractionation, is desirable for positive lymph nodes following primary lymphadenectomy, WEGHAUPT (27) used 50 to 60 Gy in the same situation, while a tumour dose of 45 Gy was reported by SCHULTZ et coll. (19).

The radiation doses administered were probably also too low when only irradiation was used for the regional lymph nodes. DALY & MILLION (4) recommended a 'tumour dose' of 45 Gy in fractions of 2 Gy per day as adjuvant treatment of clinically normal inguinal regions. If this is given with 5 fractions a week, it corresponds to a CRE value of 14. No regional treatment failures were recorded in 6 patients with observation periods of 6 to 36 months.

FRANKENDAHL et coll. (6) used 30 to 60 Gy with the same fractionation as described above. Both WEGHAUPT (27) and KUCERA (12) used a tumour dose of 60 Gy for irradiation of metastases in regional lymph nodes or when metastases were considered possible.

In the present material, higher doses were administered in patients with more advanced tumour growth in the regional lymph nodes. The recorded frequencies of regional treatment failures thus mainly reflect the status of the tumour in the regional lymph nodes. It is therefore not possible to evaluate the effect of different radiation doses.

Combined surgical and radiologic treatment of the regional lymph nodes did not give any high frequency of complications: infections occurred in 11 per cent of the patients, thrombosis in 6 per cent; skin necrosis was not observed. One reason for the low frequency of complications is probably that evacuation of the lymph nodes was done on a second

occasion, using separate incisions. Large surgical wounds, which must be covered with the surrounding skin or transplanted skin and plastic surgery were thus avoided in most cases (7, 8). As the medial–caudal part of the surgical wound was left open, the problem with lymph drainage was usually eliminated.

The frequency of moderate to severe permanent leg oedema requiring treatment with diuretics or bandaging, or both, was 13 per cent in patients with groin dissection and about 21 per cent in those who had pelvic lymphadenectomy, which agrees quite well with the reports of LUNDWALL (13), RUTLEDGE et coll. (18) and HACKER et coll. (7), even if higher frequencies have been reported elsewhere. CALAME (3) reported leg oedema in 65 per cent of 58 patients who had undergone pelvic lymphadenectomy. It is difficult to evaluate the contribution of irradiation to the occurrence of leg oedema. No such complaints were recorded when irradiation was the only treatment. The radiation doses used in combination with surgery were low or relatively low. The oedema recorded was probably mainly an effect of surgery, as has also been suggested by EDSMYR (5) and ACOSTA et coll. (1).

Due to the often high rates of morbidity at radical vulvectomy combined with lymphadenectomy, especially when pelvic lymphadenectomy is performed, different attempts have been made to modify the treatment technique. HACKER et coll. (7) described a surgical technique especially suitable for patients without clinical suggestion of regional metastases, where vulvectomy and lymph node evacuation were performed with separate incisions. Serious complications were observed in 21 per cent of the patients after such surgery, and of these, 14 cases had a major breakdown of the groin incision. The same incidence of leg oedema was found. This technique gave lower morbidity, and the survival rate was not affected. Another method is to replace the adjuvant inguinal lymphadenectomy by irradiation, as has been proposed by several authors (4, 6, 8, 19, 27). Reports on the use of this method in cases of squamous cell carcinoma in other parts of the body have been published (28). FRANKENDAHL et coll. (6) reported no regional treatment failures in 12 patients treated for squamous cell carcinoma in the vulva after a radiation dose of 30 to 60 Gy to the inguinal regional lymph nodes. Three regional metastases occurred in 17 patients not given irradiation. SCHULTZ et coll. (19) reported one case of regional metastasis in 38 patients treated prophylactically with an absorbed radiation dose of about 60 Gy in the inguinal regions, and 5 metastases in 35 patients not given prophylactic treatment.

Most therapists prefer lymphadenectomy instead of irradiation alone as curative therapy for possible or demonstrated metastases in the regional lymph nodes, if the age and general condition of the patient allow such a measure (8). It is a general experience that it is difficult to eradicate clinically manifest lymph node metastases by radiation therapy alone. One reason for this might be the lower sensitivity to radiation of the often hypoxic central areas of palpable tumours.

WEGHAUPT (27) and KUCERA (12) used 50 to 60 Gy in the inguinal regions, however, even in these situations, and used surgery only when the metastases did not respond to irradiation.

Conclusions. Ipsilateral inguinal lymphadenectomy appears to be adequate for treating one-sided vulvar carcinomas when metastases in the inguinal regions are not suggested (N0–N1) and if no metastases are found at histopathologic examination of the excised lymph nodes. If metastases are demonstrated, the present authors are of the opinion that a contralateral inguinal lymphadenectomy should also be performed. If metastases in the inguinal region are found or considered possible (N2–N3) bilateral inguinal lymphadenectomy is performed, and this is also the policy at this department in midline tumours regardless of the lymph node status.

Pelvic lymphadenectomy is not considered to be indicated when the inguinal lymph nodes are not malignant. The value of pelvic lymphadenectomy is doubtful, even in cases with positive inguinal lymph nodes. Pelvic metastases are usually signs of spread of the disease beyond surgical cure, and non-surgical therapy with less morbidity therefore seems preferable.

The preoperative irradiation of the inguinal lymph node regions with the absorbed target dose described appears to be adequate.

Postoperative irradiation in patients with positive inguinal lymph nodes should cover the inguinal, external and interiliac lymph node regions on both sides, and should preferably be given with higher target doses than were used in this series.

For adjuvant irradiation in patients not submitted to lymphadenectomy higher target doses should probably be given than were used in this series. In patients with possible or demonstrated metastases

in the inguinal regions (N2–N3) not operated upon with lymphadenectomy, the inguinal, external and interiliac lymph nodes should be irradiated with a target dose close to that tolerated by normal connective tissue.

Request for reprints: Dr Ernst Simonsen, Gynecologic Section, Department of Oncology, University Hospital, S-221 85 Lund, Sweden.

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