Sentinel node biopsy in vulvar cancer: Implications for staging

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- vulvar cancer
- sentinel node procedure
- lymph node metastasis
- micrometastasis
- staging

In 2008, the first Groningen International Study on Sentinel nodes in Vulvar cancer (GROINSS-V) showed that omission of inguino-femoral lymphadenectomy is safe in patients with early-stage vulvar cancer and a negative sentinel node and it simultaneously decreases treatment-related morbidity. An important part of the sentinel node procedure is pathologic ultrastaging of the removed sentinel nodes. Subsequently, since the introduction of this procedure in the standard care of patients with early-stage vulvar cancer, more and smaller inguino-femoral lymph node metastases have been diagnosed. The clinical consequences of these micrometastases are not clear yet. With increasing size of the sentinel node metastasis, chances of non-sentinel node metastases increase and those of survival decrease. The size of lymph node metastases is included in the latest staging system for vulvar cancer, however at this moment without clinical implications. Furthermore, a separate category for micrometastases is not incorporated yet. More research is needed to determine the clinical consequences of the size of (sentinel) lymph node metastases.

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Vulvar cancer

With an annual incidence of two to three per 100,000 women, vulvar cancer is the fourth most common gynaecological malignancy. In the last decades, the incidence of vulvar cancer has been increasing [1,2]. The most common histological type is squamous cell cancer, comprising about 80% of all vulvar malignancies. Other types such as melanomas, adenocarcinomas, and basal cell cancers are much less common. In this review, we focus on the staging and treatment of vulvar cancers of squamous cell origin. The mean age at diagnosis is about 70 years, and recent studies show that the increase in incidence rate is most pronounced in the oldest patient group (>80 years) [3]. Other studies, however, showed that the increase in incidence was especially attributable to the younger patients, and that this might be caused by an increase in premalignant human papillomavirus (HPV)-associated vulvar disease [4]. Squamous cell cancer of the vulva spreads by three routes: the initial metastatic spread occurs usually to the inguinofemoral lymph nodes. The overall incidence of inguinofemoral lymph node metastases is approximately 30%. The presence and number of inguinofemoral lymph node metastases is the most important prognostic factor in patients with vulvar cancer [5,6]. Both hematogenous spread and spread by direct extension are infrequent.

Staging

Vulvar cancer has been clinically staged until 1988. Considering that palpation of the groins is inaccurate in approximately 25% of the patients [7,8], the International Federation of Gynecology and Obstetrics (FIGO) changed the vulvar cancer staging to a surgico-pathological system in 1988. This staging system provided better discrimination of survival between stages than the 1970 FIGO staging system [9]. In 1994, stage IA was added to the staging system as studies showed that the risk of lymph node metastases in tumors with a depth of invasion <1 mm was negligible [10]. In 2009, FIGO staging and TNM classification were adjusted in order to allow for better prognostic discrimination between stages and less heterogeneity within stages. The number of lymph node metastases was shown to have a major impact on survival. In 1991, the results of a Gynecologic Oncology Group (GOG) study showed a 5-year survival of >90% for patients with negative nodes, 75% for patients with one to two positive nodes, 36% for patients with three to four positive nodes, 24% for patients with five to six positive nodes, and 0% for patients with seven or more positive nodes [11]. In 1991, Origioni was the first to report on the impact of the size of lymph node metastases on survival. He demonstrated 5-year cancer-related survival rates of 90.9% for patients with metastases <5 mm, 41.6% for those with metastases >5 to <15 mm, and 20.0% for those with metastases >15 mm. He also demonstrated the impact of extracapsular tumor growth (85.7% vs. 25%) [12]. These results were confirmed by others [5] and led to the incorporation of the number and size of lymph node metastases in the most recent staging system. Finally, bilaterality of lymph node metastases has been abolished, and the former stages I and II are combined in the revised classification system [13]. For an overview of the latest vulvar cancer TNM and FIGO classification, see Table 1.

Treatment

The cornerstone of treatment of patients with vulvar cancer is surgery. A Canadian study on patterns of care in 978 patients with vulvar cancer showed that 85% had at least one surgical procedure, and approximately 25% received radiotherapy [14]. The standard treatment for squamous cell cancer of the vulva has changed dramatically over the last decades. Early in the 20th century, Basset was the first to propose “en bloc” dissection of the vulva and inguinofemoral lymph nodes [15]. Taussig and Way clinically applied the principles proposed by Basset and developed radical vulvectomy with inguinofemoral lymphadenectomy “en bloc.” [16,17] The radical approach replaced simple local excision in the second half of the last century and became the standard of care for a prolonged period. The rationale for this approach was the assumption that the prognosis is better after elective inguinofemoral lymphadenectomy compared to surveillance of the groins, despite the fact that only about 30% of patients will have lymph node metastases. Although highly effective, the morbidity of this treatment modality was very high. Wound breakdown, infections, and lymphedema were of great concern and they often...
prolonged hospitalization. Since then, many modifications of surgery have been proposed in the treatment of patients with vulvar cancer. The aim of all modifications was to reduce the morbidity of vulvar cancer treatment without compromising survival rates. Strides were made with the introduction of inguinofemoral lymphadenectomy through separate groin incisions [18], replacement of radical vulvectomy by wide local excision [19], abandonment of bilateral lymphadenectomy in lateralized tumors <2 cm [20,21], and abandonment of inguinofemoral lymphadenectomy in microinvasive tumors (<1-mm depth of invasion) [10]. Due to these modifications, treatment-related morbidity has decreased, but is still significant for patients undergoing inguinofemoral lymphadenectomy, with long-term lymphedema and discomfort of the legs described in up to 50% of the patients [22,23]. At this moment, wide local excision with a tumor-free margin of 1–2 cm is advised for local treatment, with uni- or bilateral inguinofemoral lymphadenectomy, depending on the location of the tumor with respect to the midline. Only 20–30% of the patients with early-stage vulvar cancer will have lymph node metastases. The other 70–80% will probably not benefit from the inguinofemoral lymphadenectomy, but they are at a risk of the high morbidity associated with the procedure. Therefore, the most ideal approach would be a noninvasive procedure that is able to exclude lymph node metastases with a very high negative predictive value, resulting in about 70% of the patients who can safely be excluded from undergoing inguinofemoral lymphadenectomy. Until now, the results of imaging, such as computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, and positron emission tomography (PET), were not good enough to exclude lymph node metastases with a high enough negative predictive value [24]. The introduction of the sentinel node procedure provides a minimally invasive tool to assess lymph node status.

**Sentinel node biopsy**

The term “sentinel node” was first described by Gould et al. in their report on parotid gland cancer [25]. In 1977, Cabanas performed lymphangiograms in 100 cases of penile cancer and demonstrated the existence of a specific lymph node center, the so-called sentinel lymph node (SLN). He described that this appeared to be the primary site of metastases from penile cancer [26]. The first application in vulvar cancer was reported in 1994 by Levenback et al., who used only blue dye in nine patients with vulvar cancer [27]. In their following paper in which they extended their series to 21 patients, an identification rate of 86% was shown and intraoperative lymphatic mapping appeared to be safe and simple to perform [28]. In 1998, De Hullu et al. published our results of a pilot study on the combined technique (blue dye and radioactive tracer) for SLN detection in 10 patients with vulvar cancer [29]. An identification rate of 100% and no false negatives were demonstrated. Subsequently larger studies (in which the sentinel node

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**Table 1**

<table>
<thead>
<tr>
<th>TNM</th>
<th>FIGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Stage IA</td>
</tr>
<tr>
<td>T1a</td>
<td>≤2 cm with stromal invasion ≤1 mm</td>
</tr>
<tr>
<td>T1b</td>
<td>&gt;2 cm or stromal invasion &gt;1 mm</td>
</tr>
<tr>
<td>T2</td>
<td>Lower urethra/vagina/anus involved</td>
</tr>
<tr>
<td>T3</td>
<td>Involvement of upper urethra/vagina, bladder, rectal/mucosa, bone, fixed to the pelvic bone</td>
</tr>
<tr>
<td>N0</td>
<td>Node negative</td>
</tr>
<tr>
<td>N1a</td>
<td>Lymph node metastases, One to two nodes ≤5 mm</td>
</tr>
<tr>
<td>N1b</td>
<td>One node &gt;5 mm</td>
</tr>
<tr>
<td>N2a</td>
<td>Three or more nodes ≤5 mm</td>
</tr>
<tr>
<td>N2b</td>
<td>Two or more nodes &gt;5 mm</td>
</tr>
<tr>
<td>N2c</td>
<td>Extracapsular spread</td>
</tr>
<tr>
<td>N3</td>
<td>Fixed ulcerated nodes</td>
</tr>
</tbody>
</table>

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procedure was always followed by a full lymphadenectomy) were designed in order to investigate the diagnostic accuracy of the SLN procedure in patients with early-stage vulvar cancer. In 1999, Ansink et al. published their results of the sentinel node procedure with only blue dye in 51 patients with vulvar cancer. This technique appeared to be inaccurate with only a 56% identification rate of a sentinel node and two false negatives [30]. In 2000, de Hullu et al. presented our extended results of the combined procedure for sentinel node detection. A radioactive tracer and blue dye were used in 59 patients with vulvar cancer. With an identification rate of 100% and no false negatives, this seemed a promising technique [31]. Subsequently, many other centers published their results on the application of the sentinel node procedure, followed by inguinofemoral lymphadenectomy. Identification rates were high, especially with the combined procedure, and false-negative rates low. In 2008, a German multicenter study that included 127 patients showed an identification rate of 98% and a false-negative rate of 7.7%. The false-negative rate was high compared with the results reported in the literature until then. One explanation might be the inclusion of patients with T1–T3 tumors on the condition that radical excision was possible. Two out of three false-negative cases occurred in patients with tumors of at least 4 cm (40 and 56 mm), indicating that larger tumors might be less suitable for sentinel node biopsy. Experience with the sentinel node procedure was not a requirement to participate in this multicenter study, which might be another explanation for the higher false-negative rate [32]. A Polish study including patients with vulvar cancer using the same inclusion criteria as GROINSS-V (Groningen International Study on Sentinel nodes in Vulvar cancer) also showed a very high false-negative rate. They described a false-negative rate of 27%. The authors conclude that it is highly probable that the main factor responsible for the high false-negative rate was the surgeons’ experience [33]. Table 2 shows an overview of accuracy studies on the sentinel node application in vulvar cancer [30–42].

In 2008, the results of the first large prospective validation study were published, GROINSS-V. In this study, patients with squamous cell cancers of the vulva <4 cm and non-suspicious groin nodes at palpation were included. In these patients, sentinel node detection was performed using a radioactive tracer and blue dye. When the sentinel node was negative, inguinofemoral lymphadenectomy was omitted, and the patient was observed with follow-up every 2 months for the first 2 years after treatment. In the course of the study, groin recurrences occurred in a small proportion of patients with vulvar cancer having multifocal disease. We hypothesized that lymph flow in these tumors is more complex and not accurately predictable by the sentinel node procedure. This led to a protocol amendment, in which multifocal disease became an exclusion criterion. In 259 patients with unifocal

### Table 2

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Patients (n)</th>
<th>Blue dye</th>
<th>Radioactive tracer</th>
<th>Lymphoscintigram</th>
<th>Identification rate (%)</th>
<th>False negatives</th>
<th>Ref.</th>
</tr>
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<td>Ansink 1999</td>
<td>51</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>56</td>
<td>2</td>
<td>[30]</td>
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<td>37</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>100</td>
<td>0</td>
<td>[34]</td>
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<tr>
<td>De Hullu 2000</td>
<td>59</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>100</td>
<td>0</td>
<td>[31]</td>
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<td>Levenback 2001</td>
<td>52</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>88</td>
<td>0</td>
<td>[35]</td>
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<tr>
<td>Slutz 2002</td>
<td>26</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>100</td>
<td>0</td>
<td>[36]</td>
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<tr>
<td>Puig Tintore 2003</td>
<td>26</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>95</td>
<td>0</td>
<td>[37]</td>
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<td>Haupsy 2007</td>
<td>42</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>69</td>
<td>1</td>
<td>[38]</td>
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<tr>
<td>Rob 2007</td>
<td>16</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>70</td>
<td>1</td>
<td>[39]</td>
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<tr>
<td>Vidal-Sicart 2007</td>
<td>50</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>98</td>
<td>0</td>
<td>[40]</td>
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<tr>
<td>Nyberg 2007</td>
<td>47</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>98</td>
<td>1</td>
<td>[41]</td>
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<tr>
<td>Hampl 2008</td>
<td>127</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>98</td>
<td>3</td>
<td>[32]</td>
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<tr>
<td>Radziszewski 2010</td>
<td>56</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>99</td>
<td>7</td>
<td>[33]</td>
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<tr>
<td>Levenback 2012</td>
<td>452</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>92.5</td>
<td>11</td>
<td>[42]</td>
</tr>
</tbody>
</table>

Only studies with >25 patients were included.

a Blue dye was only used in 8/26 cases.

b Blue dye alone in 7/47 cases.

c Radioactive tracer and blue dye in 72/127 cases. Radioactive tracer alone in 47/127 cases, eight blue dye alone.

d All women underwent the procedure with blue dye. Preoperative lymphoscintigram and intraoperative radiocalization were required beginning 2 years after study activation.

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vulvar disease and a negative sentinel node, six groin recurrences were diagnosed after a median follow-up of 35 months (2.3%; 95% confidence interval (CI) 0.6–5%), and the 3-year disease-specific survival rate was 97%. This study also showed a major decrease in treatment-related morbidity after sentinel node dissection compared with inguinofemoral lymphadenectomy (lymphedema 1.9% vs. 25.2%, and recurrent erysipelas 0.4% vs. 16.2%) [43]. Shortly after, Levenback et al. published their results of GOG173, a large accuracy study on sentinel nodes and vulvar cancer, in which patients with tumors ≥2 cm and <6 cm were included. All patients underwent sentinel node biopsy, followed by inguinofemoral lymphadenectomy. In 286 patients with a negative sentinel node, the false-negative predictive value was 3.7%, and in women with a tumor ≤4 cm 2.0% [42]. These results closely replicated those of GROINSS-V.

Based on these two large studies, we recommend the application of the sentinel node procedure in the treatment of patients with early-stage vulvar cancer. However, in order to prevent fatal groin recurrences, the following criteria should be met:

- Histologically proven primary squamous cell vulvar cancer with a depth of invasion >1 mm.
- Tumors <4 cm, not involving anus/vagina/urethra
- Unifocal tumor
- No clinically suspicious lymph nodes
- Enlarged lymph nodes excluded by preoperative imaging (CT/ultrasound/MRI)

A major issue when performing the sentinel node procedure in vulvar cancer is the experience of the team that performs this multidisciplinary procedure. Only when high quality is ensured at each step of the procedure will fatal groin recurrences be avoided. Therefore, centers that wish to offer this procedure to their patients should have high enough exposure to guarantee good quality at every step of this multidisciplinary procedure. We advise an exposure of at least 10 patients with vulvar cancer per year to maintain experience at a high enough level. Two recent studies showed that SLN biopsy is the most cost-effective strategy for the management of patients with early-stage vulvar cancer due to lower treatment costs and lower costs due to complications and its impact on quality of life [44,45].

Currently, GROINSS-V-II is ongoing. This observational study investigates whether radiotherapy to the groins is a safe alternative for inguinofemoral lymphadenectomy in patients with a positive sentinel node. The final results of this study are expected at the end of 2017.

**Sentinel node detection protocol**

The day before the operation or the morning of the day of the operation, 0.5 ml of 30–100 MBq (depending on the local situation, interval between injection and surgery, sensitivity of the probe, etc.) technetium-labeled nanocolloid (e.g., Solco Nuclear, Birsfelden, Switzerland) is injected circumferentially intradermally on four locations around the primary tumor. Half an hour before the injection, an anesthetic cream (e.g., lidocaine–prilocaine 5%) is applied on the vulva for pain relief. An anterior images are obtained using a single-head gamma camera with a low-energy high-resolution collimator. Within 5 min after injection, dynamic imaging is started during 30 min. An anterior and lateral static image is obtained after 2.5 h. The first-appearing persistent focal accumulation is considered to be a sentinel node, especially when a direct connection from the injection site to the sentinel node is visible. On the day or the afternoon after the injection of the radioactive tracer, following induction of anesthesia, 2.0 ml of blue dye (e.g., Patent Blue V; Guerbet, Paris, France) is injected intradermally on the same four locations around the primary tumor approximately 5–10 min prior to the surgical procedure. The surgical procedure starts with identification and removal of the sentinel nodes. During operation, a handheld gamma ray detection probe (Neoprobe) is used to find the area of greatest activity in the groin. A small skin incision is made at this point and a sentinel node excision biopsy is performed using the handheld gamma ray detector and by dissection of blue-stained lymph vessels. Sentinel nodes are sent to the pathologist. Subsequently, resection of the vulvar lesion is performed. When identification of the sentinel node is not successful because of low radioactivity, the primary tumor is removed first. By resection of the primary tumor together with the primary
micrometastases. This is in agreement with the definitions of breast cancer. In breast cancer, micrometastases are defined as the maximum dimension of the largest tumor deposit in the lymph node can be no larger than 2.0 mm. In breast cancer, there is also a separate term for the considerably small metastases: submicrometastases; this term is reserved for metastases no larger than 0.2 mm. In breast cancer, submicrometastases are classified as N0 and are treated in the same way as SLN-negative patients [55].

The clinical significance of “micrometastases” in vulvar cancer is unclear. Micrometastases would be clinically significant when they are associated with non-sentinel node metastases (indicating inguinofemoral lymphadenectomy). In an in-depth analysis of the sentinel nodes from GROINSS-V, it was shown that the proportion of patients with non-sentinel node metastases increases with the size of sentinel node metastasis. One of 24 patients with only isolated tumor cells in the sentinel node had non-sentinel node metastases (4.2%), two of 19 with metastases <2 mm (10.5%), two of 15 with metastases >2 mm and <5 mm (13.3%), and 10 of 21 with metastases >5 mm (47.6%). These data show low risk of non-sentinel node involvement in the case of minimal sentinel node involvement; however, they do not support a cutoff below which chances of non-sentinel node metastases are so low that inguinofemoral lymphadenectomy can be omitted. Furthermore, disease-specific survival for patients with sentinel node metastases >2 mm was lower than for those with sentinel node metastases ≤2 mm (69.5% vs. 94.4%, p = 0.001) [54].

Further data are needed to learn about the clinical significance of these small metastases, and to establish their possible role in clinical decision making.

Implications for staging

The literature on micrometastases in vulvar cancer is scarce. In a study reanalyzing lymph nodes by immunohistochemistry that were previously negative with standard H&E, Narayansingh et al. showed...
that after immunohistochemistry 42% (13/31) of women were found to have micrometastases. Nine women (29%) developed recurrent disease; eight were in the group with the micrometastases. Of the remaining 18 women without micrometastases, only one recurred (hazard ratio (HR) 19.6, CI 2.3–171) [53]. Micrometastases in this study were related to the development of recurrent disease. However, the side of recurrences was not mentioned (local/groin?) and the sample size was very small.

As a consequence of ultrastaging, more and smaller metastases are found in lymph nodes, implicating that approximately 12–42% of women with previously FIGO stage I disease will be upstaged to FIGO stage III. The clinical implications of these micrometastases are not clear, but there is evidence that smaller metastases have a better prognosis compared to larger metastases [5,12,54]. This stage migration will therefore lead to better survival for the group patients with stage III disease, because patients with smaller metastases that were previously not diagnosed are classified stage III now. Probably, this will also lead to better survival for patients with stage I disease, because more patients with previously occult metastases are no longer in this stage.

As the size of nodal metastases is an important prognostic factor for patients with vulvar cancer, the seventh edition of the TNM classification is a step forward, because for the first time vulvar cancer classification takes the size of lymph node metastases into account. However, micrometastases are not a specific subcategory in this staging system, and this is probably the group with the best prognosis. In the N category of the TNM classification, the distinction is made between metastases smaller or larger than 5 mm. In the future, a new TNM classification should also include a separate category for micrometastases. What the exact size limits of these metastases will be and whether there will also be a subcategory for isolated tumor cells need further investigation. Data indicate that the prognosis for patients with only isolated tumor cells in the sentinel node is comparable to that of node-negative patients [54]. This supports a separate category for these patients in the next TNM classification.

Postoperatively, radiotherapy is indicated for vulvar cancer patients with more than one lymph node metastasis, or in the presence of extranodal tumor growth. This policy is based on a study by Homesley et al., in which vulvar cancer patients with lymph node metastases at inguinofemoral lymphadenectomy were randomized between pelvic lymph node dissection and postoperative radiotherapy. The results of survival were in favor of the radiation group, and the benefit was most pronounced in those patients who presented with clinically suspicious or fixed ulcerated groin nodes, or two or more positive lymph nodes [55,56]. It seems that adjuvant radiotherapy is not beneficial in patients with only one intranodal lymph node metastasis [57]; however, data are conflicting on this subject [6]. Treatment guidelines are based on data obtained in the “pre-sentinel node era.” Whereas the rationale for postoperative radiotherapy in the case of two lymph node metastases >2 mm is argued by none, the evidence for postoperative radiotherapy in the case of two SLNs with only isolated tumor cells is at least questionable. Data on this subject in vulvar cancer are not available. In other tumors, indications for postoperative treatment are not comparable to vulvar cancer, and therefore comparable data in other tumors are not available.

GROINSS-V-II is investigating the use of radiotherapy in sentinel node-positive patients. The size of sentinel node metastases is determined in all participating patients. We recommend all investigators performing clinical studies in patients with early-stage vulvar cancer to incorporate assessment of the size of (sentinel) lymph node metastases in their protocol. Hopefully, with time, more data will become available on the clinical significance of sentinel node micrometastases in vulvar cancer. Until then, lymph node metastases should be treated according to current treatment guidelines, independent of their size.

Summary

Treatment of vulvar cancer has greatly improved in the last decades, with the introduction of the sentinel node procedure as the last introduced major advantage for decreasing treatment-related morbidity. A part of the sentinel node procedure is the detailed examination of the removed sentinel nodes. Subsequently, more and smaller metastases are diagnosed. Studies show that the chances of non-sentinel node metastases increase and those of survival decrease with increasing size of the sentinel node metastasis. The size of metastases is included in the latest staging system for vulvar cancer, however without clinical implications. Further research is needed to determine the clinical consequences of the size of (sentinel) lymph node metastases.

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Conflicts of interest

The authors indicated no potential conflicts of interest.

Practical points

- The sentinel node procedure can be considered as the standard of care in well-selected patients with unifocal squamous cell cancers <4 cm without suspicious inguinofermoral nodes at imaging and performed by an experienced multidisciplinary team.
- As a consequence of the sentinel node procedure, more and smaller metastases are diagnosed, of which the clinical significance is not clear yet.
- Until more data are available on this subject, all patients with sentinel lymph node metastases should be treated by inguinofermoral lymphadenectomy, independent of their size.

Research agenda

- Future clinical studies in vulvar cancer are encouraged to incorporate the size of metastases in their protocol in order to create more data on this subject.
- Indications for radiotherapy in the case of micrometastases.

References


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