New insights into photodynamic therapy of the head and neck
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Chapter 3

Photodynamic Therapy Of Early Stage Oral Cavity and Oropharynx Neoplasms: An Outcome Analysis of 170 Patients

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ABSTRACT

BACKGROUND

Photodynamic therapy (PDT) of oral cavity and oropharynx neoplasms have not gained popularity. The main reason is that it is indications and success rates are not well established.

METHODS

The current paper analyzes our institutional experience of early stage oral cavity and oropharynx neoplasms (Tis-T2) to identify the success rates for each subgroup according to T stage, primary or non-primary treatment and subsites.

RESULTS

In total 170 patients with 226 lesions is treated with PDT. From these lesions 95 are primary neoplasms, 131 were non-primaries (recurrences and multiple primaries). The overall response (OR) rate is 90.7% with a complete response (CR) rate of 70.8%. Subgoup analysis identified oral tongue, floor of mouth sites with more favorable outcome.

CONCLUSION

PDT has more favorable results with certain subsites and with previously untreated lesions. However PDT can find its place for treating lesions in previously treated areas with acceptable results.
1. INTRODUCTION

Photodynamic therapy is a relatively new method for management of head and neck neoplasms. Surgery and radiotherapy are long accepted as the standard treatment for head and neck neoplasms with long successful track record [1,2]. This standard approach has an established success rate approaching 95% for early stage neoplasms [3,4]. The upper aerodigestive tract has important functions such as respiration, swallowing and phonation. Standard treatment of the neoplasms of head and neck region, although not frequent with superficial neoplasms, might compromise one or more of these functions. Especially with repeated treatments for recurrent and multiple primaries these problems become more evident [5-8]. New reconstructive techniques, less invasive surgical modalities like laser or robot assisted endoscopic surgery, more precise delivery of radiation with techniques such as intensity modified radiation treatment (IMRT) all aim to decrease the morbidity rate [9-12].

PDT is searching its role in the era of conservation therapies. The advantage of PDT is local treatment without long-term systemic effects. The photosensitizing drug is activated by the light delivered directly onto the neoplasm, sparing the surrounding normal mucosa. Protection of the surrounding tissue is further assured by shielding with wet sponges or special shielding waxes.

An additional advantage of PDT is that it shows its effect via cytotoxicity rather than destructive effects. This means that when cancer cells are eliminated via apoptosis the extracellular matrix remains forming a scaffold for the surrounding mucosal tissue to advance over [13,14]. Scar formation is minimal and the native tissue that replaces the cancer cells maintains its normal functions limiting the functional loss significantly. Perhaps the most important aspect of PDT is its repeatability. PDT can be applied to the same area without accumulative destructive effects [15-17]. It also does not negatively effect further treatments such as radiation or chemotherapy [15] leaving further treatment options open.

In spite of these advantages PDT remains unknown to many head and neck oncologists [17-19]. To be able to establish PDT in the management cascade of head and neck oncology, we believe it is important to have a basic knowledge of what degree of success can be expected in various clinical scenarios. The current paper is aiming to analyze retrospectively a sub-group of patients with early stage oral cavity and oropharynx neoplasms to demonstrate what percentage of success to expect with PDT. This analysis includes neoplasms of different subsites of the oral cavity and oropharynx, primary neoplasms versus recurrences or multiple primary neoplasms in previously conventionally treated fields.
2. PATIENTS AND METHOD

The registry of patients treated with PDT was retrospectively screened to identify patients with early stage (Tis, T1, T2) oral cavity and oropharynx squamous cell cancers that did not have lymphatic or distant metastasis. The registry contained 294 patients treated between 1996 and 2008. With the primary elimination 170 patients who meet the inclusion criteria are identified within the registry.

All patients were subject to pre-treatment evaluation according to the guidelines of our institute. Standard minimum evaluation consisted of: biopsy to determine the histological diagnosis of squamous cell cancer or carcinoma in situ (Tis); X-ray of the thorax; ultrasound (US) of the neck and fine needle aspiration (FNA) to determine nodal metastasis situation. Tumor thickness is measured either by US or magnetic resonance imaging (MRI). All patients included in the analysis had tumors with less than 5 mm of deep tissue invasion and had initially N0 neck. According to the guidelines of our institute no prophylactic neck dissections are performed and the neck node status is followed by US and FNA if indicated, at 6-month intervals. Patients were informed of potential benefits and risks of the treatment and instructed about light avoidance measures and supplied with a light meter to measure ambient light.

mTHPC (temoporfin, Foscan®, Biolytec Pharma Ltd., Dublin, Ireland) at a dose of 0.15 mg/kg was injected to a deep vein with slow infusion. Patients were discharged home after the injection. Illumination took place 96 hours after the mTHPC injection. Light is delivered by a diode laser at 652 nm. Radiant exposure is 20 J/cm² with a irradiance of 100 mW/cm². Preferred method is to deliver light with one spot delivered via a microlens. If one spot illumination is not applicable due to the shape or location of the neoplasm multiple spots were used. The lesion plus 5 mm margin of normal appearing mucosa is illuminated. All patients received corticosteroids and pain management. Hospital stay depended on the functional limitations after PDT due to location and extent of the neoplasm, as well as edema due to PDT.

2.1. TUMOR RESPONSE

Tumor Response is analyzed according to the World Health Organization (WHO) criteria [21]:
Complete response (CR): the disappearance of all known disease
Partial response (PR): 50% or more decrease in the dimensions of the tumor
No response (NR): Less than 50% decrease or less than 25% increase in tumor dimensions.
Progressive disease (PD): 25% or more increase in the size of one or more measurable lesions or the appearance of new lesions.

All responses have to be confirmed by two observations not less than 4 weeks apart. Overall response (OR) is the sum of complete and partial responders.

2.2. FOLLOW-UP

There is a follow-up schedule of 1,2,4,8,16,24,36,52 weeks after PDT, followed by routine controls every 4 months for a total of 5 years.

3. RESULTS

3.1. PATIENTS

Of the 170 patients evaluated, 80 were female and 90 were male. The average age at treatment was 60.5 years. A total of 226 neoplasms was treated with PDT, 35 patients are treated for 2 or more neoplasms. The sites treated and the T stages can be found in Table 1.

Of the evaluated neoplasms, 95 are primary neoplasms, 131 were non-primary neoplasms consisting of 65 recurrences, 46 second, 9 third and 3 fourth primary neoplasms and of 8 residual neoplasms after initial treatment. Previous treatments within the non-primary neoplasm group (n= 131) include: radiotherapy 48.1%, chemoradiation 22.7%, surgery 75.6% and previous PDT 30.6%.

Table 1. Overview sites and stages

<table>
<thead>
<tr>
<th>Site</th>
<th>Stage</th>
<th>Dys/CIS</th>
<th>T1</th>
<th>T2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor of mouth</td>
<td>T1</td>
<td>25</td>
<td>30</td>
<td>10</td>
<td>65</td>
</tr>
<tr>
<td>Oral Tongue</td>
<td>T1</td>
<td>12</td>
<td>24</td>
<td>-</td>
<td>36</td>
</tr>
<tr>
<td>Soft Palate</td>
<td>T1</td>
<td>8</td>
<td>15</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>Buccal Mucosa</td>
<td>T1</td>
<td>5</td>
<td>15</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>T1</td>
<td>7</td>
<td>13</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>Alveolar Process</td>
<td>T2</td>
<td>10</td>
<td>7</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Retromolar Trigon</td>
<td>T2</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Hard Palate</td>
<td>T2</td>
<td>3</td>
<td>5</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Nasal Cavity</td>
<td>T2</td>
<td>-</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>69 – 30.5%</td>
<td>121 – 53.5%</td>
<td>32 – 14.2%</td>
<td>226</td>
</tr>
</tbody>
</table>

Dys/CIS: dysplasia/ carcinoma in situ
3.2. TUMOR RESPONSE

The overall response (OR) rate for all neoplasms is 90.7% (95% CI, 86.2%-94.2%) with a CR rate of 70.8% (95% CI, 64.4%-76.6%). In Table 2 the responses are listed per site, per stage and primary or non-primary. The median local disease free interval for all of the CR-cases is 102.0 months (95% CI, 89.6 months-114.3 months). Two year and 5-year local disease free survival rates are 74% and 61%, respectively.

3.3. ANALYSIS PER T CLASSIFICATION

Tis lesions have an OR rate of 94.5% (95% CI, 86.6%-98.5%), with a CR rate of 79.5% (95% CI, 68.4%-88.0%); T1 neoplasms have an OR rate of 90.9% (95% CI, 84.3%-95.4%) with a CR rate of 68.6% (95% CI, 59.5%-76.7%); and for the T2 neoplasms, the OR rate is 81.3% (95% CI, 63.6%-92.8%) with a CR of 59.4% (95% CI, 40.7%-76.3%). The variations in tumor response between the stages are only statistically significant for Tis vs T2 stage tumors (P<0.05). The mean local disease free interval is 65.7 months (95% CI, 49.3 months-82.2 months) for the Tis group, 109.1 months (95% CI, 93.1 months-125.0 months) for T1 and 113.4 months (95% CI, 81.9 months-144.9 months) for T2 (figure 1). The mean survival time is 92.2 months (95% CI, 79.3 months-105.0 months) for dys/CIS, 98.4 months (95% CI, 84.6 months-112.2 months) for T1 and 78.7 months (95% CI, 54.2 months-103.2 months) for T2 tumors.

![Figure 1. Local disease free interval per T stage of neoplasms](image-url)
3.4. SUB-SITE ANALYSIS

In Table 2 an overview of all treated sites is shown. The CR rate is highest for the oral tongue site (94.4% (95% CI, 81.3%-99.3%)), the floor of mouth (76.9% (95% CI, 64.8%-86.5%)) and the soft palate (75.9% (95% CI, 56.5%-89.7%)) and lowest for the nasal cavity (37.5% (95% CI, 0.9%-75.5%)), the alveolar process (42.1% (95% CI, 20.3%-66.5%)) and the buccal mucosa (57.7% (95% CI, 36.9%-76.7%)). Oral tongue has significantly better response rate than the rest of the group (p<0.05) and alveolar process has significantly lower response rate than the rest of the group (p<0.05).

Figure 2. Local disease free interval, comparing primary neoplasms vs non-primary neoplasms

3.5. PRIMARY NEOPLASMS VS NON-PRIMARY NEOPLASMS: PRIMARY

Primary neoplasms have an OR rate of 96.8% (95% CI, 91.1%-99.3%) with a CR rate of 77.9% (95% CI, 68.2%-85.8%). For the non-primary neoplasms the OR rate is 86.2% (95% CI, 79.2%-91.7%) and the CR rate is 65.6% (95% CI, 56.9%-73.7%).

Neoplasms located in an irradiated field (n=64) have a CR rate of 57.8% (95% CI, 44.8%-70.1%); neoplasms located in an area that was treated before with surgery (n=99), have a CR rate of 62.6% (95% CI, 52.3%-72.2%). There is no statistical difference.

The mean local disease free interval for the primary neoplasms with a CR is 117.8 months (95% CI, 102.1 months-133.6 months). For the non-primary neoplasms with a CR the interval
is 84.9 months (95% CI, 67.2 months-102.7 months). One, 2 and 5-year survival of patients with primary neoplasms are 90%, 85%, and 74%, respectively. For non primary neoplasms disease free survival at 1, 2 and 5 years are 81%, 64% and 48%, respectively (figure 2). The difference in local disease free survival for primary neoplasms vs non-primary neoplasms is statistically significant (P<0.001).

The overall mean survival time for the primary neoplasms was 120.4 months (95% CI, 106.4 months-134.4 months) and for the non-primary neoplasms, this was 82.1 months (95% CI, 67.7 months-96.5 months) (figure 3). The difference in survival time for primary neoplasms vs non-primary neoplasms is statistically significant with P<0.05.

Figure 3. Overall survival, comparing primary neoplasms vs non-primary neoplasms

REGIONAL RECURRENCE

A total of 42 patients (24.7%) had neck metastasis diagnosed by US and FNA and subsequently treated with neck dissection. Eighteen of these patients (10.5%) had a neck metastasis combined with a second primary neoplasm or local recurrence. The staging of the neck after neck dissection was N1 in 26 patients, N2b in 14 patients and N2c in 2 patients. There was no N3 or inoperable neck metastasis detected in this patient series.
### Table 2. Overall and complete clinical responses to PDT per T stage and site

<table>
<thead>
<tr>
<th>SITE</th>
<th>Stage</th>
<th>Dysplasia</th>
<th>T1</th>
<th>T2</th>
<th>All stages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OR/CR/n %</td>
<td>CR/n %</td>
<td>CR/n %</td>
<td>CR/n %</td>
</tr>
<tr>
<td>Floor of mouth n = 65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>24/25</td>
<td>96.0</td>
<td>22/25</td>
<td>88.0</td>
<td>29/30</td>
</tr>
<tr>
<td>Primary</td>
<td>7/7</td>
<td>100</td>
<td>6/7</td>
<td>85.7</td>
<td>20/20</td>
</tr>
<tr>
<td>Non-primary</td>
<td>17/18</td>
<td>94.5</td>
<td>16/18</td>
<td>88.9</td>
<td>9/10</td>
</tr>
<tr>
<td>Oral tongue n = 36</td>
<td>12/12</td>
<td>100</td>
<td>10/12</td>
<td>83.3</td>
<td>24/24</td>
</tr>
<tr>
<td>Total</td>
<td>8/8</td>
<td>100</td>
<td>8/8</td>
<td>14/15</td>
<td>9.3</td>
</tr>
<tr>
<td>Primary</td>
<td>2/2</td>
<td>100</td>
<td>2/2</td>
<td>100</td>
<td>7/7</td>
</tr>
<tr>
<td>Non-primary</td>
<td>6/6</td>
<td>100</td>
<td>6/6</td>
<td>100</td>
<td>7/8</td>
</tr>
<tr>
<td>Buccal mucosa n = 26</td>
<td>5/7</td>
<td>71.4</td>
<td>4/7</td>
<td>57.1</td>
<td>11/13</td>
</tr>
<tr>
<td>Total</td>
<td>5/3</td>
<td>100</td>
<td>3/3</td>
<td>100</td>
<td>4/4</td>
</tr>
<tr>
<td>Primary</td>
<td>2/4</td>
<td>100</td>
<td>1/4</td>
<td>25.0</td>
<td>7/9</td>
</tr>
<tr>
<td>Alveolar process n = 19</td>
<td>10/10</td>
<td>100</td>
<td>6/10</td>
<td>60.0</td>
<td>4/7</td>
</tr>
<tr>
<td>Total</td>
<td>3/3</td>
<td>100</td>
<td>3/3</td>
<td>100</td>
<td>5/5</td>
</tr>
<tr>
<td>Primary</td>
<td>2/2</td>
<td>100</td>
<td>2/2</td>
<td>100</td>
<td>2/2</td>
</tr>
<tr>
<td>Non-primary</td>
<td>1/1</td>
<td>100</td>
<td>1/1</td>
<td>100</td>
<td>1/1</td>
</tr>
<tr>
<td>Hard palate n = 8</td>
<td>3/3</td>
<td>100</td>
<td>2/3</td>
<td>66.7</td>
<td>5/5</td>
</tr>
<tr>
<td>Total</td>
<td>1/1</td>
<td>100</td>
<td>1/1</td>
<td>100</td>
<td>0/1</td>
</tr>
<tr>
<td>Primary</td>
<td>0/2</td>
<td>0/2</td>
<td>0/2</td>
<td>0/2</td>
<td>0/1</td>
</tr>
<tr>
<td>Nasal cavity n = 8</td>
<td>2/2</td>
<td>100</td>
<td>1/1</td>
<td>100</td>
<td>1/1</td>
</tr>
<tr>
<td>Total</td>
<td>21/21</td>
<td>100</td>
<td>19/21</td>
<td>90.5</td>
<td>59/60</td>
</tr>
<tr>
<td>Primary</td>
<td>48/52</td>
<td>92.3</td>
<td>39/52</td>
<td>75.0</td>
<td>51/61</td>
</tr>
</tbody>
</table>

OR overall response, CR complete response, OR/n number of overall response/total number of patients treated in this subgroup, CR/n number of complete responders/total number of patients treated in this subgroup.
4. DISCUSSION

Photodynamic therapy (PDT) has been used in head and neck oncology for some time with reported success [17-19,21-31]. However the small numbers of treated patients and the heterogeneity of treated groups make it difficult to determine the limitations of PDT. Should we be using PDT for all sorts of locations and sizes of neoplasms or select sub-sites and stages that would react more favourably? Studies with limited number of patients, although report success, cannot give a clear answer to the question of what to treat and maybe more importantly what not to treat. These are all preliminary studies that were done to establish treatment protocols for PDT and subsequently treat patients to reach larger series. Results of such larger series are recently becoming available to us.

The longest experience is with photofrin mediated PDT with the largest series published by Biel with 276 patients [29]. This series include laryngeal and oral cavity neoplasms with T1-3 N0 cancers. The CR rates are impressive with 91% for laryngeal neoplasms and 94% for oral cavity tumors. However there is no sub-group analysis to show if certain subgroups of neoplasms react better.

It is possible to extend the limits of PDT with mTHPC, which is activated with 652nm light enabling deeper tissue penetration and providing treatment of deeper neoplasms [33]. A prospective multinational multi-institutional study with mTHPC-PDT was carried out with the participation of our institute. The aimed group was patients with small neoplasms of the oral cavity with less than 25 mm of diameter and less than 5 mm depth of invasion. This group of well selected oral cavity tumors showed CR to mTHPC-PDT at a rate of 85%.

Several studies used 10 mm depth of invasion as a cut-off point for mTHPC-PDT. Only the international multi-centre study carried out by D’Cruz et al applied PDT to tumors deeper than 10 mm depth of invasion [31]. Treatment of deeper tumors (up to 50 mm) was justified by the aim of the study, which was to provide palliation to incurable head and neck cancers by conventional methods. This great range of thickness enabled the authors to compare tumors with less than 10 mm depth to tumors with more than 10 mm depth. Among completely illuminated lesions with less than 10 mm depth had a much better response than deeper tumors, with CR of 60% vs 26% and OR of 75% vs 40%. Although the study population was patients with recurrent rather than primary tumors this study justifies the selection of 10 mm depth of invasion as a cut-off point for mTHPC-PDT.

In our institution, we use 5 mm as the limit depth to apply surface illumination. We base this decision on the treatment efficacy of mTHPC-PDT to 10 mm and our desire to achieve at least 5 mm of treated normal tissue margin. The tumors that are equal to or deeper than 5 mm are
treated with interstitial PDT with fibres inserted into the tissue to deliver light to the deeper parts of the tumor. These patients are beyond the scope of our analysis and therefore not reported in this manuscript. Our results for early oral cavity and oropharynx carcinoma yield similar results to those reported by other authors reporting PDT results[20-32]. When we performed subgroup analysis we have detected that certain groups of patients benefit from PDT better than others.

4.1. LOCATION OF THE NEOPLASM

Oral cavity and oropharynx are not homogenous structures that have constant tissue characteristics. The tissue composition of the alveolar process is clearly different than that of the tongue or soft palate. Furthermore some areas in the oral cavity and pharynx are flat while others have a complex geography. Multiple spots might have to be used to illuminate all the extensions of the neoplasm, theoretically making the chance of geographic miss greater.

It is therefore important to designate the favourable sub-sites of the oral cavity and oropharynx. The only sub-site that reacts significantly better is oral tongue. The reason is probably the relative homogeneity of the tissue with absence of nearby bony structures, as well as the relative ease of delivering the light in a homogeneous manner on the flat surface.

Floor of mouth and soft palate have a more complex anatomy than the oral tongue with proximal bony structures (i.e. mandible and hard palate) probably causing lower CR rates. Buccal mucosa has a relatively flat surface providing ease of illumination with a rather homogenous structure with no apparent reason for a poorer outcome than the oral tongue. Although a statistic comparison is not carried out, buccal mucosa is also observed to have more scar tissue causing mild trismus (5/23 patients).

As can be expected the neoplasms of the alveolar process have less CR rate than the overall mean. Alveolar process has a more complex anatomy with underlying mandible and has three surfaces making homogenous illumination harder to achieve. However it can be argued that the OR rate of 73.7% helps reducing the size of the neoplasm and enable a smaller excision subsequently.

The study by Hopper et al [30] is the only publication reporting success rates for subsites, with CR rates of 89% for floor of mouth, 83% for lip, 93% for anterior tongue and 83% for buccal mucosa. There are publications that report failures in certain sites but the numbers are very low to draw any conclusions.
Outcome analysis of PDT of oral cavity cancer

The numbers of retromolar trigon, hard palate and nasal cavity neoplasms treated with PDT are not enough to do a statistical analysis (9, 8 and 8 patients, respectively). However the CR rates of the retromolar triangle (66.7%) and hard palate (62.5%) are near the overall mean (70.8%).

4.2. T STAGE

It can be an expected result because as the neoplasm area gets larger delivering light evenly gets harder and the risk for geographic miss gets greater. In our series we do not observe such a difference. Although T1 tumors have a better CR rate than T2 tumors this is not statistically different (table 2). Therefore we can say that the size of the tumor does not make a difference as long as all of the tumor can be fully illuminated and the depth of invasion is less than 5 mm.

In our series Tis show a higher CR rate than T1 and T2 tumors with 79.5%. Tis recur much earlier than T1 and T2 tumors (mean disease free interval of 65.7 months for dyplasia vs 109.1 months for T1 and 113.4 months for T2 tumors) (figure 1). It is well known that patients with Tis of the upper aerodigestive tract are prone to develop new leukoplakias a number of times [34]. It should be kept in mind that PDT can be repeated a number of times with minimal morbidity to treat leukoplakias as they recur. Copper et al reported up to 85% success with treating second primary tumors with PDT [32]. The success of repeated treatments as lesions recur becomes evident by the similar survival rates of patients with Tis and T1 neoplasms. The difference in disease free interval is made up for either by successful retreatments or the relatively less lethal nature of Tis.

4.3. RECURRENCES AND MULTIPLE PRIMARY NEOPLASMS

Recurrences and multiple primary neoplasms pose a challenge to the head and neck oncologist. Most of these lesions occur in the previously irradiated or operated fields [36,37]. The study by D’Cruz et al focused on such patients who had refractory neoplasms of the head and neck area that were unsuccessfully treated or unsuitable for conventional treatments [31]. They report 38% OR and 16% CR. It should be noted that this study was a multi-centre, multinational study with vague inclusion criteria, resulting in treatment of neoplasms that may not be suitable for surface PDT. When the lesions that were not fully illuminated and deeper than 10 mm were excluded they report an OR rate of 54% with 30% CR rate.

In our series a total of 131 patients with recurrent, second or multiple primary neoplasms were treated with PDT. Even though non-primary neoplasms respond less favourably to PDT than primary neoplasms (65.9% vs 77.9% CR, respectively, p<0.05), 65.9% CR is
a considerable success if we take into account that the treated area received radiation in 48.1%, chemoradiation in 22.7% and previous surgery in 75.6% of the patients. Furthermore there is an 86.3% OR which means that an additional group of lesions decrease in size which makes subsequent surgical resection smaller. The difference with the study by D’Cruz et al can be accounted to the more conservative selection criteria by our group.

4.4. MANAGEMENT OF NECK NODES

Elective treatment of N0 neck in case of early oral cavity cancers is a point of debate. Studies comparing elective neck dissection with wait and see policy show no difference in overall survival [38]. In experienced hands, US of the neck combined with FNA can reach a sensitivity of 73% and a specificity of 100% [39]. We adopted the wait and see policy for patients staged as N0 by US of the neck. Neck recurrences can be detected by regular US and FNA controls and the patients can receive subsequent neck dissections. This approach resulted in 24.7% patients receiving neck dissections. All of these patients had resectable neck nodes, which were adequately removed after neck dissections. The number is quiet high if you take into consideration that the tumors in question are thinner than 5 mm. This phenomenon can be explained with the association of the neck recurrence with second primary or recurrent tumors in almost half of the cases. It can be speculated that only 13% of the patients had neck recurrences that are associated with the tumor treated by PDT. Depending on the preference and policies of the center, elective neck dissection can be combined with PDT. The neck dissection has to be done either before PDT or 2–3 weeks after PDT. There is no evidence to prefer one timing to the other.

5. CONCLUSION

Our institutional experience supports the value of temoporfin-PDT in carefully selected patients. Especially neoplasms in areas that can receive a homogenous distribution of light react very favourably to mTHPC-PDT. Perhaps even more significant, difficult to treat lesions such as recurrent neoplasms and multiple primary neoplasms located in previously irradiated or operated fields have a very acceptable CR rate provided that they are carefully selected for eligibility.
6. REFERENCES


