

THE ROLE OF MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS AND STAGING OF ORAL SQUAMOUS CELL CARCINOMA: CASE REPORTS

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ABSTRACT

Introduction: Oral Squamous Cell Carcinoma (OSCC) is oral cancer with various clinical presentations. Therefore, to assist in establishing the diagnosis, supporting examinations are needed, one of which is MRI which is non-invasive and harmless to the patient. This case report aims to describe 3 suspected cases of OSCC and the differential diagnosis of chronic traumatic ulcers using Magnetic Resonance Imaging (MRI) to support the diagnosis and staging of OSCC.

Case Report: The first case a 73-years-old woman, complained of canker sores, pain, difficulty chewing since 3 months. Intraoral examination revealed ulcers, irregular, positive induration, 0.5x1cm in size, on the right lateral tongue, tooth region 46. Histopathological examination was performed and the results showed invasion of malignant cells. An MRI was performed with a suspected malignant neoplasm at stage T1N0. The second case, a 45-years-old woman, complained of canker sores on the right tongue, pain and stiffness, since 2 months. Intraoral examination revealed ulcers, irregular, positive induration, size 2x5cm, on the right lateral tongue, tooth region 46-48. On MRI examination, an inhomogeneous solid mass was seen in the right corpus glossus area, accompanied by enlarged lymph nodes. The third case, a 83-years-old woman, complained of canker sores, pain when swallowing, since 3 weeks. Intraoral examination revealed an ulcer, irregular, positive induration, 2mm in size, on the right side of the tongue, in the region of 16 roots. MRI examination showed nodules measuring 9x17mm, suspected inflammatory/infectious lesions accompanied by acute tonsillitis right, less supportive of malignant neoplasms.

Conclusion: Non-invasive MRI plays an important role in establishing a definitive diagnosis and staging OSCC

INTRODUCTION

Oral squamous cell carcinoma (OSCC) is the 6th rank cancer worldwide, in Indonesia oral squamous cell carcinoma ranges from 3-4% of all cancer cases.¹ The risk factors for squamous cell carcinoma are smoking and alcohol consumption, non-vegetarian diet, poor OH, poor dental conditions that can cause trauma to the soft tissues of the oral cavity, and infection with the human papilloma virus (HPV).² The most common site

predilection for oral squamous cell carcinoma is the lateral tongue, floor of the mouth, buccal mucosa, gingiva and soft palate.³ The development of oral squamous cell carcinoma in the early stages is usually asymptomatic and tends to be ignored by patients so that it is detected too late. Most of patients with oral squamous cell carcinoma are diagnosed at an advanced stage, so that 50% of patients survive only for 5 years. In order to speed up the diagnosis, additional investigations are

needed.^{1,4} The standard for the diagnosis of oral squamous cell carcinoma is based on the results of histopathological examination of tissue biopsy results, while the staging of oral squamous cell carcinoma is determined based on clinical examination and diagnostic imaging.^{5,6} Diagnostic imaging in cases of oral squamous cell carcinoma is needed to help determine the clinical stage based on tumor expansion, regional lymph node metastases and the extent of metastasis, and determine the most appropriate type of treatment for the patient.⁷

Imaging technologies that are widely used in dentistry are conventional radiography, Computerized Tomography (CT) scan, Cone Beam Computed Tomography (CBCT) but are not ideal for imaging soft tissues. Magnetic Resonance Imaging (MRI) technology is able to properly image soft tissue conditions.⁶ Medical examination using MRI began in the 1980s. The main advantage of MRI is that it does not use ionizing radiation. The working principle of MRI is to take advantage of changes in the direction of protons of an atomic nucleus with a positive charge in a magnetic field. The simplest atom in the body is hydrogen which has 1 proton in its nucleus and 1 electron in its orbit. The signal generated from the hydrogen proton is used to form an MRI image.⁸

MRI examinations generally use several sequences to obtain images that provide information about the condition of the body. Tissues with high fat content in T1-weighted sequences appear light (hyperintense), whereas tissues with high water content appear dark (hypointense). T1-weighted images are generally used to determine the anatomical condition of the body.⁹ Another MRI sequence is T2-weighted, on T2-weighted images, tissues with high water content appear hyperintense, and tissues with high fat content

appear hypointense. T2-weighted images are commonly used to identify pathological conditions. Pathological tissue is generally accompanied by inflammation with more water content than the surrounding healthy tissue, so it appears hypointense on T1-weighted images, but appears hyperintense on T2-weighted images.⁹ Soft tissue tumors appear isointense (showing the same signal) with healthy tissue on T1-weighted images and appear isointense or hyperintense on T2-weighted images.⁹

To clarify the area of soft tissue tumors on MRI images, gadolinium contrast media is generally used to provide more accurate information about the condition of soft tissue tumors, but contrast media is contraindicated for patients with impaired renal function.¹⁰ Oral squamous cell carcinoma metastases can be well observed using MRI. MRI modalities can also be used to determine the depth or thickness of tongue cancer, but MRI cannot detect tongue cancer with a thickness of less than 5 mm. A number of studies have shown that the thickness of tongue cancer is positively correlated with the risk of cervical lymph node metastases and the risk of primary tumor recurrence. The thicker the primary tumor on the tongue, the higher the risk of finding metastases in cervical lymph nodes.^{11,12}

CASE REPORT

The first case, a 73-year-old woman, came to the department of oral medicine with a chief complaint of canker sores on the right side of the tongue since 3 months ago. Previously the patient visited the dental clinic, and the sharp teeth had been sharpened by the dentist, but the canker sores did not improve. On extraoral examination there is lymphadenopathy in the submandibular gland, pain. Intraoral examination revealed an ulcer with white

plaque surrounded by erythema on the right lateral tongue of tooth 46. (Figure 1) Based on the history and clinical examination, the patient was referred to the surgical oncology department for a biopsy, and for symptomatic complaints the lesion was treated with chlorhexidine digluconate 0,12% mouthwash. Histopathological (figure 2) showed malignant cell invasion.

MRI examination (figure 3, 4, and 5) of the head and neck without contrast was performed with axial, coronal and sagittal sections T1W SE and T2W FSE fat sat, followed by gadolinium contrast IV axial, coronal and sagittal sections T1W SE fat sat. The right anterior 2/3 of the tongue shows an elongated mass with ulcers and exophytic growths, post-contrast appears to be amplified 11x22x20 mm. mass does not cross the midline, does not invade surrounding tissue. The mandibular bone did not appear to be destructive. Lymph nodes (KGB) left right and right supraclavicular neck were not enlarged. The nasopharynx, oropharynx, larynx and nasal cavity, paranasal sinuses, parotid and submandibular glands did not show any abnormalities. Conclusions from MRI examination, suspected malignant neoplasm of tongue in the right anterolateral 2/3 measuring 11x22x20 mm, did not cross the midline, did not invade the surrounding tissue, did not show metastasis to regional lymph nodes. TNM staging: T1 N0.

The second case, a woman, aged 45 years, came to the department of oral medicine with complaints of thrush on the right back of the tongue since two months ago due to being bitten. Previously, the patient had gone to the dentist and had the remaining root of the tooth extracted near the canker sore but the canker sore did not healed. To relieve pain the patient took dexketoprofen. The

patient has difficulty swallowing and lifting the tongue. On extraoral examination there was lymphadenopathy in the submandibular and cervical glands, pain. Intraoral examination (figure 6) revealed a well-defined ulcer, irregular, yellow-black base, tend to bleed, measuring about 2x5 cm extending to the dorsum of the tongue, there was induration to more than the median to the base of the tongue. Based on the history and clinical examination, the patient was referred to the surgical oncology department for further examination, to reduce pain the patient was treated with chlorhexidine digluconate 0.12% mouthwash and nystatin oral suspension.

Oropharyngeal MRI examination (figure 7,8, and 9) was performed with axial-sagittal T1W1, axial-coronal T2-W1, axial T2-FLAIR, axial DWI-ADC, axial HEMA. Scanning is done without and using contrast. The cut is made parallel to the hard palate. The results of the MRI examination showed an isodense lesion with firm borders, regular edges, measuring 6x2,37cm with a depth of invasion of 3.04 cm which seemed to originate from the corpus glossus dextra, passing through the lingual septum obliterating muscle (m) intrinsic glossus, m. right genioglossus, especially right palatine tonsil and right soft palate, constricts the oropharyngeal air column at the level of 2-3 cervical vertebrae. Post contrast scanning appears to provide an inhomogeneous enhancement. The coronal section shows isointense lesions on T1W1 and T2W1 in the inferior right hippocampal area. Post contrast scanning does not appear to be an enhancement. Looks like multiple lobulated isodense lesions with clear borders, regular edges, the largest diameter is 2.63 cm as high as levels II, III, IV and V colli bilaterally. Conclusion on MRI examination there was an inhomogeneous solid mass in the right corpus glossus area, passing through the lingual

septum, obliterating m. intrinsic glossus, m. right genioglossus, palatine tonsil, especially right and right soft palate, narrowing of the oropharyngeal air column at the level of 2-3 cervical vertebrae with enlarged lymph nodes at level II, III, IV and V colli bilaterally.

The third case, a 83-years-old woman, came to the department of oral medicine with complaints of thrush on the right side of the tongue and pain in swallowing since three weeks ago. History of systemic illness was denied. The patient has been treated to an ENT and neurologist specialist and to a dentist but there is no improvement. From intraoral examination (figure 10), there was an endo-exophylic ulcer on the right lateral tongue, 2mm in size, positive induration, pain and there was gangrene of the dental pulp 16. The patient was initially diagnosed with suspected OSCC with a differential diagnosis of traumatic ulcer et causa trauma, and was recommended for an MRI examination and referred to oncology surgeon. The patient was given chlorhexidine digluconate 0.12% as much as 10 ml, 3 times a day.

The patient underwent an MRI scan (figure 11) of the whole brain without contrast with sagittal sections T1W 3D SPGR IR Prep, T2W 3D FSE and T2W FLAIR 3D FSE 1mm thickness, Axial MAGIC (MAGnetic resonance image Compilation) axial 7 sequences, axial T2* GRE and axial DWI. MRI examination of the head and neck without contrast was performed with axial, coronal, and sagittal sections T1W SE and T2W FSE fat sat axial DWI (Diffusion Weighted Imaging), followed by Gadolinium contrast IV axial, coronal, and sagittal

sections T1W SE fat sat and dynamically with Dynamic Contrast Enhancement (DCE). Right tongue lateral juxta molars and posterior teeth on T2W showed hyperintense lesions, post contrast showed nodules with enhancement measuring 9x17 mm, on DWI there was no restricted diffusion, on DCE Time intensity curve there was a gradual increase in contrast density in early and late phases. The right tonsil on T2W shows a hyperintense lesion, post-contrast appears enhanced, on DWI it appears as a restricted diffusion lesion. The left and right cervical lymph nodes (KGB) were not enlarged. The nasopharynx, oropharynx, larynx, nasal cavity, paranasal sinuses, parotid glands and left and right submandibular masses were not seen. Periventricular and subcortical white matter on T2W showed multiple small hyperintense lesions, the periventricular area was partially confluent, on T2W FLAIR no cavities were seen, on DWI there was no restricted diffusion lesion / Fazeka grade II. Right left lateral ventricle, 3rd ventricle, cortical sulci and left right sylvian fissure and mild wide cerebellar sulci. The density of the cerebelli parenchyma is good. The brain stem showed no abnormalities. Conclusion of MRI examination, Nodule measuring 9x17 mm on the right lateral tongue as described previously suspected an inflammatory/infectious lesion with right acute tonsillitis, not supporting a malignant neoplasm. The right and left neck lymph nodes were not enlarged. Mild atrophy of the cerebrum and cerebelli with moderate ischemic changes in the left and right periventricular and subcortical white matter.



Figure 1. A-73 years woman diagnosed with suspected OSCC. Endo-exophytic, irregular, ulcerated lesions are seen, surrounded by erythema..

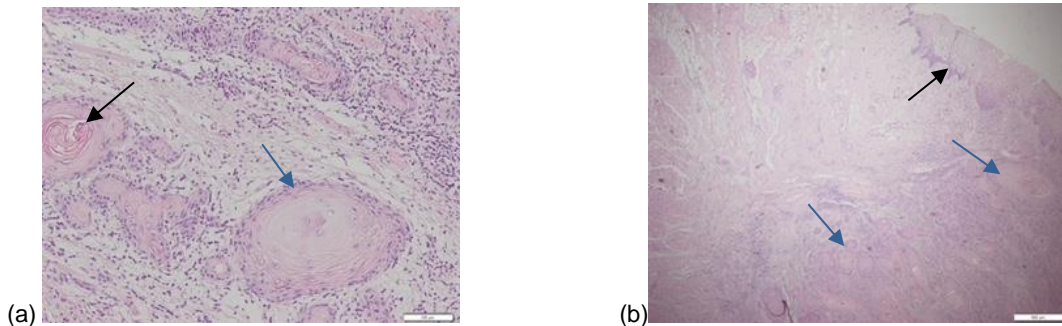


Figure 2. (a). Histopathological description of case 1 (100x magnification). (b). Black arrows represent keratin pearls, blue arrows indicate tumor mass (20x magnification). Black arrows indicate stratified squamous epithelium, blue arrows indicate tumor mass

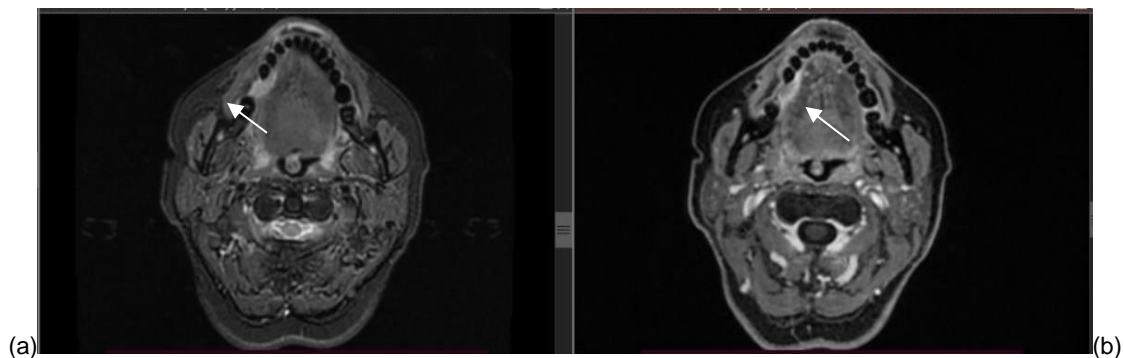


Figure 3. (a). Axial T2 weighted fat-suppression shows a right-sided heterogeneous hyperintense lesion that is well demarcated on the lateral edge of the tongue (white arrow). (b). Axial post contrast T1 weighted fat-suppression shows heterogeneous enhancement (white arrows)

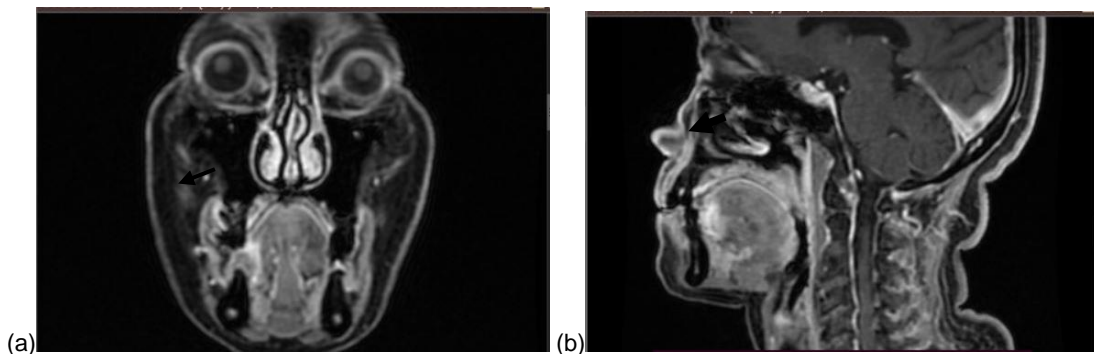


Figure 4. (a). Coronal and (b) sagittal post contrast T1 weighted fat-suppression image showing heterogeneous enhancement showing a right-sided heterogeneous hyperintense lesion well demarcated on the lateral margin of the tongue with extension to the genioglossus muscle and intrinsic tongue muscle (black arrows)

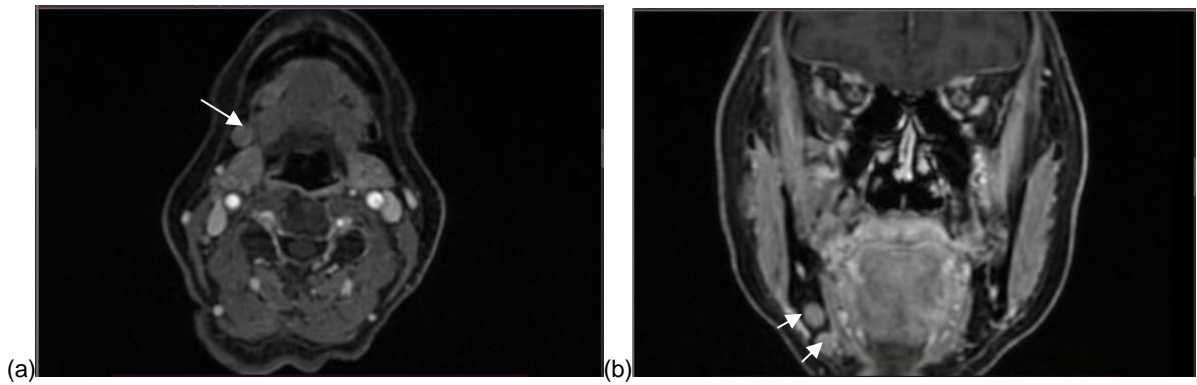


Figure 5. (a). Axial (white arrow) and (b) sagittal (white arrow). Post-contrast T1 weighted fat-suppression image showing unilateral multiple submandibular lymphadenopathy.



Figure 6. A-45 years old woman, has well-defined ulcers, irregular, yellow-black base, tend to bleed, about 2x5 cm in size extending to the dorsum of the tongue, there is induration to more than the median of the tongue to the base of the tongue.

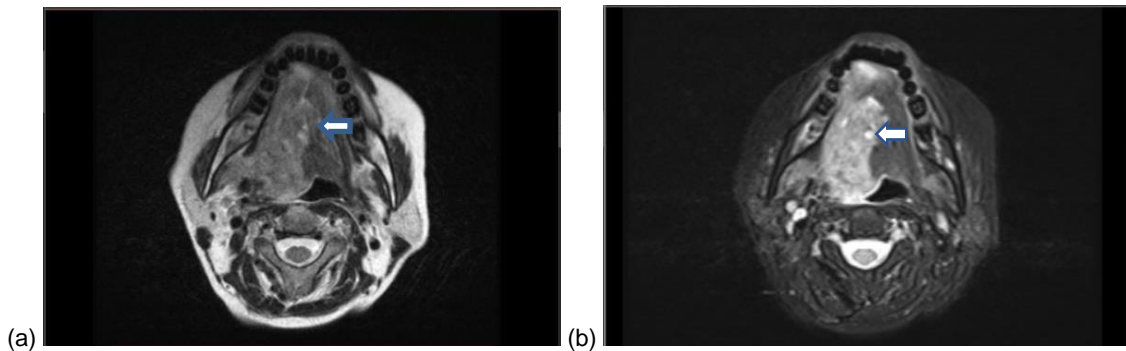


Figure 7. (a). Axial T2 weighted image shows a well-defined right-sided heterogeneous hyperintense mass extending into the lingual septum (solid white arrow). (b). Axial post contrast T2 weighted fat-suppression image shows heterogeneous enhancement (solid white arrow).

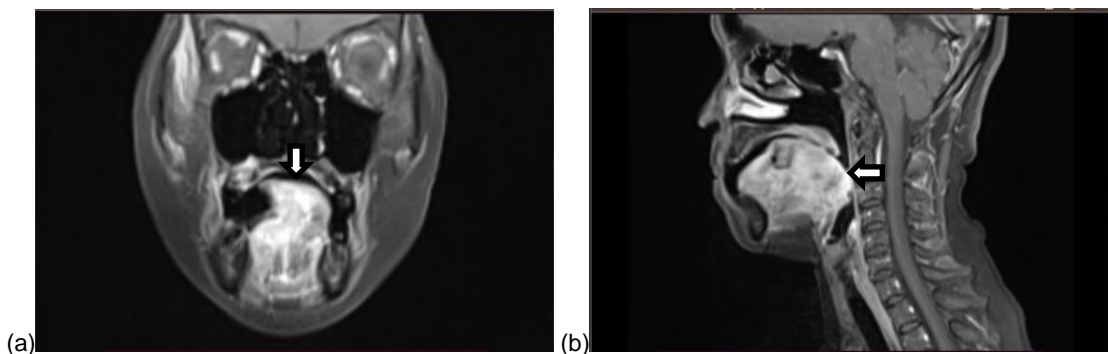


Figure 8. (a). Coronal and (b) sagittal post contrast T1 weighted fat-suppression images show heterogeneous enhancement of a well-defined right-sided tongue mass with invasion of the genioglossus muscle, intrinsic muscles and base of the tongue (white open arrow), right palatine tonsil (not shown here), and close the pharynx.

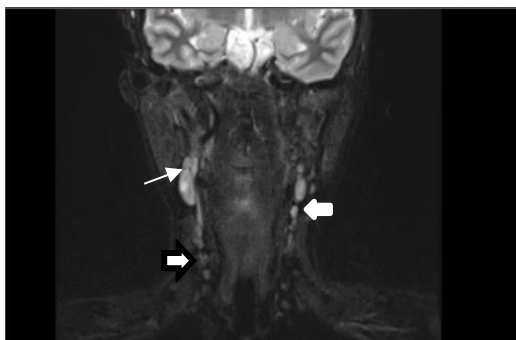


Figure 9. Coronal T2 weighted recovery inversion image showing bilateral multiple lymphadenopathy (upper – white arrow, middle white solid arrow and lower white jugular open arrow).



Figure 10. A-83 years old woman, there is an endo-exophylic ulcer on the right lateral tongue, size 2mm, positive induration, pain and there is gangrene of the dental pulp.

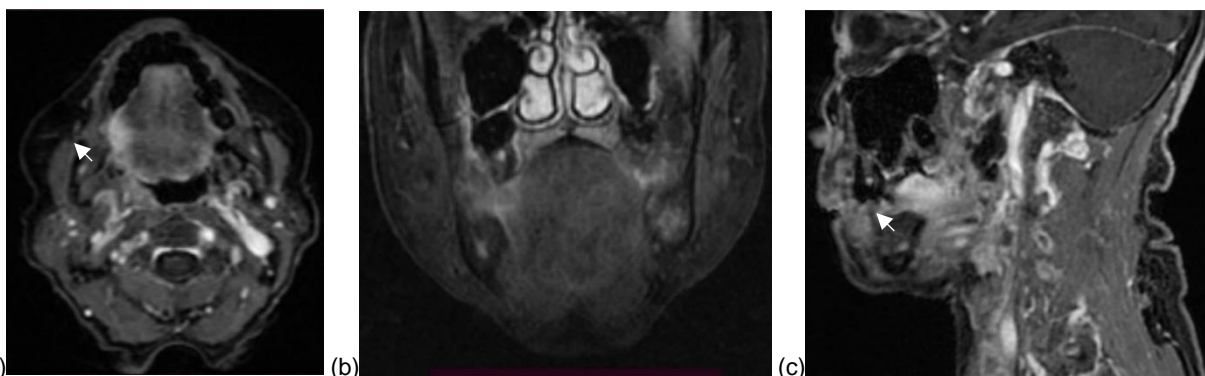


Figure 11. (a) Axial, (b) coronal and (c) sagittal post contrast T1 weighted fat-suppression shows a right-sided heterogeneous hyperintense lesion that is well demarcated on the lateral edge of the tongue with extension to the genioglossus muscle (white arrows).

DISCUSSION

MRI is the most widely used investigation to determine the stage of cancer in the head and neck region, and can be used to determine the most appropriate treatment plan for the patient. The MRI

method can be used to obtain information about the extent of the primary tumor, cancerous infiltration of blood vessels, and lymph node metastases.^{7,13} In this case, only the first patient underwent a biopsy,

while the second and third patients did not do a biopsy because from the results of the MRI examination, the second patient had metastases, while the third patient from the MRI examination was diagnosed with traumatic ulcers and the patient's age was old so that no biopsy.

MRI is superior in visualizing soft tissue, and does not cause radiation to the patient so that the MRI examination procedure is biologically safer, MRI is superior in evaluating bone marrow invasion and detecting perineural involvement.¹⁴ The imaging modality of MRI does not produce ionizing radiation and does not damage cells, but MRI requires a very strong magnetic field. This is because the working principle of MRI uses magnetic resonance, therefore medical equipment used by patients in an MRI examination must be made of materials that do not interact with magnetic fields, metal objects or other materials that can interact with magnetic fields must be kept away from MRI examination room because it can be dangerous for the patient and operator.^{6,14} In terms of examination time, MRI procedures take longer than other imaging modalities, and are not widely available in Indonesia.

The results of the MRI examination, in the first and second cases the diagnosis of OSCC was established, the third patient, the results of the MRI examination, had no isodense lesions. The first and second cases underwent different therapy. The first case underwent partial glossectomy therapy, because the conclusion of the MRI examination was that there were no metastases to lymph nodes. Glossectomy is a term used in surgical procedures for resection of tumors on the tongue. There are several classifications of glossectomy, namely: type 1 glossectomy (mucosectomy), type 2 glossectomy (partial glossectomy, type 3a glossectomy (hemiglossectomy), type 3b glossectomy

(compartmental hemiglossectomy, type 4a glossectomy (subtotal glossectomy), type 4b glossectomy (near-total glossectomy), type 5 glossectomy (total glossectomy)).¹⁵

The second case, underwent chemotherapy because the results of the MRI examination suspected lymph node metastases due to bilateral lymph node enlargement as high as level II, III, IV and V colli. The difference in therapy in these two patients has the same goal, namely: eliminating cancer from the patient's body, restoring physiological function as much as possible, maintaining or seeking to restore cosmetic function as optimally as possible. In the third case, from the results of the MRI examination, the patient was diagnosed with an upright traumatic ulcer, because there was no isodense lesion, and was referred to oral surgery for tooth extraction.

CONCLUSION

Early diagnosis of OSCC has the opportunity to be successful in treatment, and MRI is one of the supporting examinations that has advantages in accelerating diagnosis, determining the stage of cancer, and the therapy to be carried out.

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CONFLICT OF INTEREST

All authors state that there is no conflict of interest.

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