Majority Science Journal (MSJ) Vol. 4 No. 2, May 2026
P-ISSN: 0000-0000; E-ISSN: 3025-1990
Available : https://jurnalhafasy.com/index.php/msj DOI: https://doi.org/10.61942/msj.v4i2.584

Effectiveness Of Ct-Scan Parameters For Nasopharyngeal Examination In Clinical Nasopharyngeal Carcinoma Toward Anatomical Information At The Radiology Department Of Rst Dr. Reksodiwiryo Padang

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Input :April, 21 2026 Revised : May 05, 2026
Accepted :May 07, 2026 Published : May 13, 2026

Abstract

Nasopharyngeal carcinoma is a malignant tumor in the head and neck area that requires accurate supporting examinations, one of which is CT-Scan. This study aims to determine the effectiveness of nasopharyngeal CT-Scan examination parameters with clinical nasopharyngeal CA on anatomical information. The type of research used is qualitative research with observation methods and in-depth interviews with two radiographers and one radiology specialist as well as a review of patient image results. The study was conducted at the Dr. Reksodiwiryo Army Hospital, Padang, from July to October. Data were collected regarding patient preparation, examination techniques, and the suitability of parameters with theoretical standards. The examination was performed with the patient in a supine head-first position, scanning the area from the MAE to the third thoracic vertebrae, with a slice thickness of 5 mm, a window width of 350, and a window level of 40. The results showed that despite differences with the theory that recommends a slice thickness of 2.5 mm and a superior scan area, the parameters used in the hospital were still able to display important anatomical structures, including thickening of the nasopharyngeal cavity roof, intracerebral extension, maxillary sinus image, parapharyngeal space, oropharynx, paranasal sinuses, orbital cavity, parotid gland, and mastoid. Diagnostic information was considered adequate to establish a diagnosis of nasopharyngeal CA, but the radiologist recommended expanding the scan area to the upper part to evaluate the temporal lobe and intracranial area. The CT-Scan parameters used at RST dr. Reksodiwiryo Padang were effective for examining nasopharyngeal CA although they could still be optimized

Keywords: CT CT-Scan nasopharynx, examination parameters, effectiveness, anatomical information, CA nasopharynx

Citation :
Nansih L A et al 2026 Effectiveness Of Ct-Scan Parameters For Nasopharyngeal Examination In Clinical Nasopharyngeal Carcinoma Toward Anatomical Information At The Radiology Department Of Rst Dr. Reksodiwiryo Padang *MSJ: Majority Science Journal*, *4*(2), 39-47

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P-ISSN: 0000-0000; E-ISSN: 3025-1990
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Introduction

Nasopharyngeal carcinoma (NPC) is a malignant tumor that grows in the Rosenmüller tissue of the nasopharynx and the upper part of the nasopharynx. Neck cancer is located in a hidden location and is connected to many vital points, making it difficult to diagnose initially (Roezlen, CH & Iskan, A. 2019). Nasopharyngeal carcinoma (NPC) is a malignant cancer of the nasopharyngeal epithelial cells influenced by many factors such as heredity, behavior, and environment (Kadarullah et al., 2022).

Based on Riskesdas (2018), the prevalence of cancer in Indonesia is 1.79% of 1,017,290, and contributes the second highest mortality rate due to nasopharyngeal cancer in the world after China. According to the Indonesian Ministry of Health (2022), the prevalence of cancer in Indonesia is 396,914 cancer cases and 234,511 cancer deaths. Meanwhile, according to Roezien, CH & Iskan, MI (2019) in (Nuraini, 2021), the prevalence of Nasopharyngeal Carcinoma (NPC) in Indonesia is around 6.2/100,000 out of 13,000 new cases and most are reported from the island of Java. In Central Java province, it is 2.11% of 132,565 cancer cases.

A nasopharyngeal CT scan is a radiological examination that uses X-rays to visualize the anatomical structures and disease processes in the nasopharynx (the upper, back part of the nasal cavity). This examination is very useful for detecting masses, bone erosion, infiltration into the sinuses or skull base, and helps determine the stage of nasopharyngeal cancer (nasopharyngeal carcinoma) (Romans, 2011).

According to Romans (2011), the CT-Scan examination technique for the nasopharynx in cases of nasopharyngeal CA requires the patient to remove objects that interfere with the image such as iron or metal, the examination begins from the middle of the orbit to the clavicle head, with the patient positioned head first and supine on the examination table with both hands placed beside the body. The slice thickness used is 2.5 mm to obtain an image with good image quality, using a window width of 350 and a window level of 50 and using a voltage of 120 kV and a current of 150 mA.

In the Radiology Installation of RST. dr. Reksodiwiryo Padang based on the applicable SOP for nasopharyngeal CT-Scan examination procedures in patients with nasopharyngeal CA cases, before the examination there is no special preparation done to the patient, the patient is only asked to remove objects that will interfere with the image such as metal and iron. Next, the patient is positioned supine (head first) with both arms straight at the side of the body, the patient is instructed to remain still and not move during the examination. Position the patient's head symmetrically and parallel to the MCP and MSP (parallel to the red cross line lamp on the gantry) with the CP on the mandible, apply a patient strap to reduce movement, cover the patient's body with a blanket. Examination with the MAE limit and the lower limit of the thoracic vertebrae III with axial and coronal cuts, slice thickness 5 mm, window width 350 and window level 40.

Based on the description above, there are differences in the scan area where according to Romans (2011), the nasopharyngeal CT-Scan examination is the upper limit of the mid-orbit and the lower limit of the clavicle heads, slice thickness 2.5 mm, window width 350 and window level 50, while in the Radiology Installation of RST dr. Reksodiwiryo Padang, the scan area starts from MAE to thoracic vertebrae III with a slice thickness of 5 mm for window width 350 and window level 40.

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This study aims to determine the effectiveness of clinical nasopharyngeal CT-Scan examination parameters for nasopharyngeal CA on anatomical information at the Radiology Installation of Dr. Reksodiwiryo Padang Hospital.

The increasing incidence of nasopharyngeal carcinoma (NPC) in Indonesia demonstrates that this disease remains a serious health problem requiring accurate and early diagnostic approaches. Delays in diagnosis frequently occur because the nasopharynx is anatomically located deep within the head and is difficult to visualize clinically during routine physical examination. Patients with NPC often present with non-specific symptoms such as nasal obstruction, epistaxis, tinnitus, hearing loss, or cervical lymph node enlargement, causing many cases to be detected at an advanced stage. Therefore, radiological imaging has an essential role in identifying the location, extent, and spread of lesions in nasopharyngeal carcinoma. One of the imaging modalities widely used is Computed Tomography (CT-Scan), because it is able to provide detailed anatomical information of soft tissue structures and surrounding bones. CT-Scan examination is also considered effective in evaluating infiltration into adjacent structures such as the paranasal sinuses, skull base, intracranial cavity, and cervical lymph nodes. The accuracy of the resulting anatomical image is highly influenced by the examination parameters used, including scan area, slice thickness, window width, and window level settings. Therefore, optimization of examination parameters is very important to obtain optimal image quality and support accurate diagnosis in patients with nasopharyngeal carcinoma.

Differences in examination techniques and parameter settings between theoretical references and hospital SOPs may affect the anatomical information produced on CT-Scan images. Slice thickness that is too large can reduce spatial resolution and obscure small lesions or subtle infiltration around the nasopharyngeal tissue. Likewise, differences in determining the scan area may affect the completeness of the anatomical coverage required in evaluating the extent of nasopharyngeal carcinoma spread. Appropriate window width and window level settings are also crucial in differentiating soft tissue contrast and visualizing lesion boundaries clearly. In clinical practice, each radiology installation may implement different protocols adjusted to equipment specifications, patient conditions, and institutional policies. However, differences in protocols need to be evaluated to determine whether the resulting images still provide optimal anatomical information for establishing diagnosis and staging. Evaluation of examination parameters is therefore important to ensure the effectiveness and quality of radiological services. Through proper parameter optimization, CT-Scan examination can provide more accurate anatomical visualization and support appropriate clinical management in patients with nasopharyngeal carcinoma.

Research regarding the effectiveness of nasopharyngeal CT-Scan examination parameters is still important to develop, particularly in hospitals that manage a high number of oncology cases. The Radiology Installation of RST dr. Reksodiwiryo Padang has implemented its own examination protocol in nasopharyngeal carcinoma cases, but evaluation of the effectiveness of these parameters on anatomical information has not been widely studied. Differences in slice thickness and scan area between the hospital SOP and the literature theoretically may influence image detail and diagnostic value. Therefore, assessment of the resulting anatomical information becomes necessary to determine whether the applied parameters are capable of demonstrating important anatomical structures optimally. This study is expected to provide scientific

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information regarding the effectiveness of clinical CT-Scan parameters used in nasopharyngeal carcinoma examinations. In addition, the results of this study may serve as evaluation material for radiographers and radiologists in optimizing examination protocols. The study findings are also expected to contribute to improving the quality of radiological diagnostic services, particularly in head and neck imaging. Ultimately, optimization of CT-Scan examination parameters is expected to support early detection and improve the management of patients with nasopharyngeal carcinoma.

1. Method

The type of research conducted is qualitative research with descriptive methods. The type of research conducted is qualitative research with descriptive methods. The researcher reasons for using purposive sampling, namely to collect data that is truly real or real by interviewing an informant who is considered to know or master a particular skill or job in his field. Qualitative research does not question the number of informants, but can depend on the appropriateness of the selection of key informants, and the complexity of the diversity of social phenomena studied.. The informants who will assess the results of this radiograph are 1 radiologist and 3 radiographers.Senior with a minimum Diploma 3 who has worked for more than 5 years in the Radiology Installation of Dr. Reksodiworyo Hospital, Padang.Data Processing: A triangulation method was used to analyze the data from interviews with informants, then the data was presented in table form.After that, conclusions and suggestions are drawn

2. Results and Discussion

Result

1. Overview Results

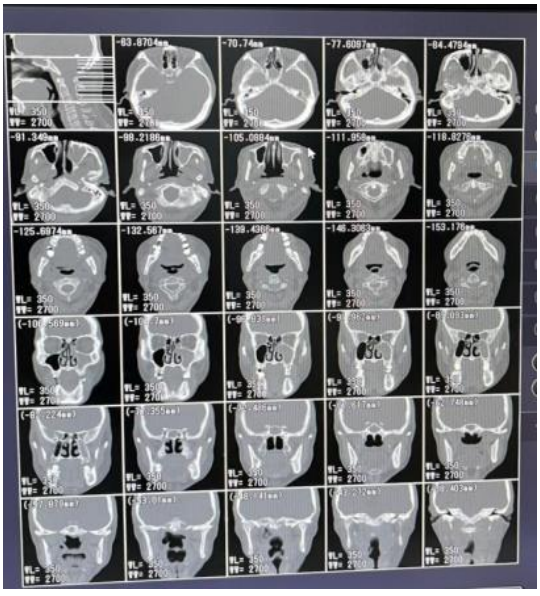

*Figure 1 CT-Scan image results*which is used at RST dr. Reksodiwiryo Padang

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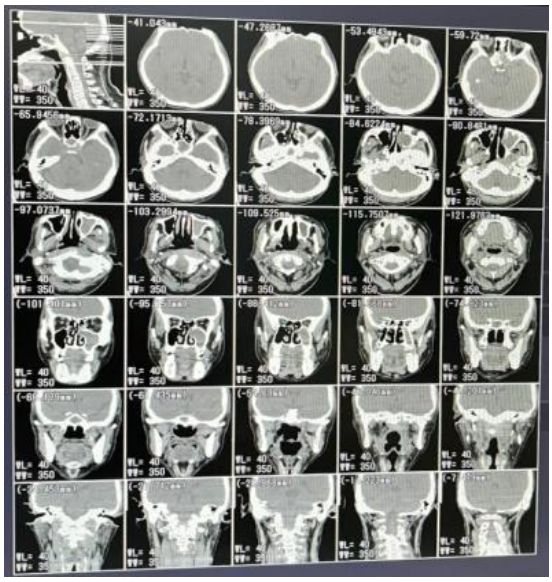

*Figure 2 CT-Scan image results*according to theory

2. Data Triangulation Results

Question	Answer
1. What are the patient preparations for a nasopharyngeal CT scan with clinical nasopharyngeal CA?	There is no need for special preparation, the patient is only asked to remove objects around the object to be examined.
2. Does using a scan area from MAE to the third thoracic vertebrae show the results of a nasopharyngeal CT scan with clinical nasopharyngeal CA?	The upper limit is added to obtain an intra-cerebral image if the tumor spreads to the intra-cerebral and temporal lobes.
3. What is the purpose of using the scan area for a nasopharyngeal CT scan examination with clinical nasopharyngeal CA?	In order to focus more on the image to be captured and the image will be more detailed
4. Can the use of axial and coronal sections confirm the diagnosis?	Must use axial, coronal and sagittal sections to establish the diagnosis.
5. Is using a slice thickness of 5 mm, scanning the area from MAE to vertical thoracic III, window width 350 and window level 40 effective in nasopharyngeal CT-Scan examination with clinical nasopharyngeal CA?	The parameters used in RST are effective
6. Is it not necessary to add a bone window in a CT-Scan examination of the nasopharynx with clinical nasopharyngeal CA?	Need to add bone window to see tumor extension around bone
7. Can using a window width of 350 and a window level of 40 show the	The parameters used in RST can confirm a diagnosis of level 40

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results of a nasopharyngeal CT scan with clinical nasopharyngeal CA?	
8. Is it necessary to add a bone window to a nasopharyngeal CT scan examination with clinical nasopharyngeal CA?	Depends on the doctor's request.
9. What are the assessments of nasopharyngeal CT scan results to diagnose patients with clinical nasopharyngeal CA?	

DISCUSSION

By using a slice thickness of 5 mm, scanning the area from MAE to the third thoracic vertebrae, a window width of 350 and a window level of 40, can we confirm the diagnosis?

According to Romans 2011, CT-Scan examination of the nasopharynx uses a slice thickness of 2.5 mm, scan area from the middle of the orbit to the clavicle head, window width 350 and window level 50. Based on the results of observations and interviews regarding the effectiveness of CT-Scan examination parameters of the nasopharynx with clinical CA nasopharynx using a slice thickness of 5 mm, scan area from MAE to thoracic vertebrae III in the Radiology Installation of RST dr. Reksodiwiryo Padang, there are differences in parameters between the theory and those at RST dr. Reksodiwiryo Padang where the use of slice thickness at RST is thicker than the theory, and also differences in the scan area and window level.

According to Romans in 2011 regarding Nasopharyngeal CT-Scan examination using a scan area from the middle of the orbit to the clavicle head, slice thickness 2.5 mm, window width 350 and window level 50 shows the results of anatomical information images of the maxillary bone, masseter M, spinal cord, vertebral a, pharynx, ramus mandibula, mastoid tip, vertebra spinosus process, splenius capitus, spinal cord, sternohyoid, thyroid cartilage, sternocleidomastoid, and vertebral body.

According to the results of interviews with radiologists at RST, using nasopharyngeal CT-Scan parameters with clinical nasopharyngeal CA can already establish a diagnosis. By using a slice thickness of 5 mm, scanning the area from MAE to the third thoracic vertebrae, a window width of 350 and a window level of 40, it is able to show thickening of the roof of the nasopharyngeal cavity, visible expansion in the intracerebral, visible clouding of the maxillary sinus, visible parapharyngeal space, visible oropharynx, visible paranasal sinuses, orbital cavity, and oculi bulbs, visible parotid glands, and visible mastoid.

According to the results of interviews with radiologists at RST, CT-Scan examination of the nasopharynx according to Romans' theory in 2011 uses scan area parameters from the middle of the orbit to the clavicle head, slice thickness 2.5 mm, window width 350 and window level 50 and CT scan examination of the nasopharynx based on the SOP at RST uses scan area parameters from MAE to thoracic vertebrae III, slice thickness 5 mm, window width 350 and window level 40 both of which are able to show good images and can establish a diagnosis.

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Is using a slice thickness of 5 mm, scanning the area from MAE to the third thoracic vertebra, window width 350 and window level 40 effective?

According to Romans, 2011 CT-Scan examination of the nasopharynx using a slice thickness of 2.5 mm, scan area from the middle of the orbit to the clavicle head, window width 350 and window level 50. Based on the results of observations and interviews with 2 radiographers and 1 radiology specialist doctor regarding the effectiveness of CT-Scan examination parameters with clinical CA nasopharynx based on the SOP in RST using the slice thickness parameter of 5 mm, scan area from MAE to thoracic vertebrae III, window width 350 and window level 40 is effective and able to show the expansion of the mass in the nasopharynx area, However, according to the radiology specialist doctor at RST, it is recommended that the scan area of the CT Scan examination of the nasopharynx needs to be added to the upper part in order to obtain an image of the intracerebral and temporal lobe if there is spread or expansion of the tumor in the intracerebral part.

3. Conclusions and Suggestions

According to the results of interviews with radiologists at RST, using nasopharyngeal CT-Scan parameters with clinical nasopharyngeal CA can already establish a diagnosis. By using a slice thickness of 5 mm, scanning the area from MAE to the third thoracic vertebrae, a window width of 350 and a window level of 40, it is able to show thickening of the roof of the nasopharyngeal cavity, visible expansion in the intracerebral, visible clouding of the maxillary sinus, visible parapharyngeal space, visible oropharynx, visible paranasal sinuses, orbital cavity, and oculi bulbs, visible parotid glands, and visible mastoid. Based on the results of observations and interviews regarding the effectiveness of CT-Scan examination parameters with clinical CA nasopharynx based on the SOP in RST using the slice thickness parameter of 5 mm, scan area from MAE to thoracic vertebrae III, window width 350 and window level 40 is effective and able to show the expansion of the mass in the nasopharynx area, However, in the scan area of the nasopharynx CT-Scan examination needs to be added to the upper part to get an intra-cerebral and temporal lobe image if there is spread or expansion of the tumor in that part.

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