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Recommended Citation
Mazni, Yarman and Robby, Rizky DK (2018) "CT Scan as A Diagnostic Modality of Gastrointestinal Stromal Tumor: A Systematic Review," The New Ropanasuri Journal of Surgery: Vol. 3 : No. 2 , Article 2.
DOI: 10.7454/nrjs.v3i2.50
Available at: https://scholarhub.ui.ac.id/nrjs/vol3/iss2/2

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CT Scan as A Diagnostic Modality of Gastrointestinal Stromal Tumor: A Systematic Review

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Email: yarmanmazni@gmail.com Received: 23/Jun/2018 Accepted: 20/Aug/2018 Published: 20/Oct/2018

http://www.nrjs.ui.ac.id DOI 10.7454/nrjs.v3i2.50

Abstract

Introduction. Preoperative diagnosis of GIST is an important factor in the management. However, due to the rarity of the case, there is a controversy about the accuracy of CT scan as an accurate diagnostic tool. Therefore, a systematic review is required to find out the answer.

Method. A review was conducted to find out evidence of the highest level regarding the accuracy of CT scan as a diagnostic modality of GIST. The study addressed to find out the sensitivity, specificity, positive and negative predictive values. A literature search carried out in database sites i.e. PubMed, ClinicalKey, ScienceDirect, and Cochrane using keywords “gastrointestinal stromal tumor” OR “GIST” AND “ultrasound” OR “CT scan” OR “MRI” AND “diagnostic” OR “imaging”. Systematic reviews, RCTs, cohort study, case report or series, studies in adults, published within the last ten years, and availability in full text were included. Correspondence, editorial, or commentary, and no histopathology data were excluded. The articles were critically appraised. The review proceeded in accordance with PRISMA.

Results. Twelve studies were analyzed in the study. The sensitivity of CT scan was in range of 77.26–94.9%, specificity 77.2–100%, PPV 74.38–100%, and NPV 68.32–81.2%. CT scan was found to be the modality of choice in establishing the diagnosis of GIST. Central necrosis, heterogeneous enhancement, cavitation without lymphadenopathy were the features represented by CT scan.

Conclusion. CT scan is the modality of choice in establishing diagnosis of uncomplicated GIST, with sensitivity and specificity of 94.9% and 100%, respectively. Other modalities were considered in advanced or GIST with metastasis.

Keywords: Gastrointestinal stromal tumor; CT scan, ultrasound, MRI

Introduction

Gastrointestinal Stromal Tumor (GIST) is a rare soft tissue sarcoma comprising 1–3% of all gastrointestinal cancers and 5.7% of all sarcomas.1,2,3 However, GIST is the most common mesenchymal tumor of the gastrointestinal tract with incidence 900 cases per year in United Kingdom.4 The highest incidence found in those of 50–60 years old and predominantly in males.5 This tumor may be found along the GI tract, mostly in the gaster (60–70%), small intestines (20–30%), and occasionally in the esophagus, mesenteries, omentum, colon, and rectum (5–8%).6 The most common clinical manifestation is GI bleeding from mucosal ulcers, that manifested as hematemeses, hematochezia, melena, or anemia in those with occult bleeding.7 Other signs and symptoms may include nausea, vomiting, abdominal pain, weight loss, abdominal distension, intestinal obstruction, and dysphagia in patients with esophageal GIST.8 Clinical manifestations were found in vary depends on tumor size and location. In small sized tumor, the manifestations may be absent; tumors are unintentionally found on radiologic examination or surgical procedure for any other condition.

Nowadays, surgery remains the main modality in the management of GIST. Recent studies showed that molecular targeted therapeutic agents such as imatinib mesylate may be benefit, though infrequent, and is indicated in unresectable or metastasized GIST.9,10 Though in small sized tumor, GIST has a great potential to a malignancy. Thereby, an effort addressed to differentiate GIST to other subepithelial tumors accurately is crucial to decide management plan and prognosis.11 To date, diagnosis of GIST is established by imaging as surgical biopsy for specimen carries on the risk of tumor rupture and tumor seeding along the tract of biopsy.12 CT scan is reported to have a superiority in differentiating GIST to non-GIST as CT provides accurate tumor size, location, and tumor heterogeneity.13 There’s a group of experts believed that the accuracy of CT scan to be superior in diagnosing GIST, while as in contrast others recommend other modalities. Thus, a study aimed to find out evidence of the highest level.

Method

This systematic review conducted in accordance with meta–analysis report algorithm arranged by preferred reporting items for systematic review and meta–analysis protocols (PRISMA). Literature search was conducted in online database sites (PubMed and Cochrane) using keywords “gastrointestinal stromal tumor” OR “GIST” AND “ultrasound” OR “CT scan” OR “MRI” AND “diagnostic” OR “imaging”. Systematic reviews, RCTs, cohort study, case report or series, studies in adults, publication within the last ten years, and availability in full text were included. Correspondence, editorial, or commentary, and no histopathology data were excluded. The articles were critically appraised. The study addressed to find out the sensitivity, specificity, positive and negative predictive values. The use of MRI, USG, and PET scan to diagnose GIST. Important data
obtained from every article were summarized in the tables of data extraction.

Results

On literature search, there were a total of 719 studies found. On filtering, there were 79 articles found. Next, 67 articles were excluded due to inability in fulfillment of the criteria such as the absence of histopathology result which is the gold standard of diagnosis of GIST, and pediatric. Thus, a total of 12 studies enrolled to the study.

Discussion

Gastrointestinal stromal tumor is a rare one. CT scan is the first diagnostic modality of choice on GIST. A study Lee et al showed that the features of CT scan features compared to surgical findings, metastasis, Hounsfield Unit value, contrast effect, complication, tumor size and location from the pathologic confirmed the GIST. In this study out of 12, a total 6 studies were evaluating the use of CT scan in establishing the diagnosis of GIST, two studies focused on the use of ultrasound, two studies focused on the use of FDG–PET/CT, and a study focused on the use of CT scan compared to endoscopy.

Most of the studies showed that GIST found in the stomach (70%), in the mesenteries of the jejunum (30%), and extraluminal GIST (70%). Tumor margins are well defined in 76% subjects. Contrast CT scan showed homogenous and heterogeneous changes at 13 and 4 Hounsfield Unit. The average result of Hounsfield unit is 30.41 ± 5.01. Other studies have shown the efficacy of CT scan as Baheti et al did in 2015 who compared the sensitivity and specificity of CT scan to other diagnostic modalities. On their study is show that CT scan provide a same sensitivity and specificity compared to ultrasound and Doppler ultrasound. Cai et al (2015) who analyzed subjects diagnosed with GIST focused on clinical signs, physical examination and CT scan as variables on the study showed CT scan has a good sensitivity and speciﬁcity. Miedzybrodzki et al (2017) found CT scan sensitivity and speciﬁcity is 89% and 100%, respectively. Choi et al (2014) found high sensitivity of 94.9% and speciﬁcity of 93.8%. Study by Horton et al (2014) also showed that CT scan is the first choice of diagnostic modality.

Diagnostic modalities other than CT scan namely ultrasound is frequently used for early detection and follow up purpose. Study of Lassau et al (2012) showed that ultrasound is the less invasive method,20 however, it showed poor results as it presents a wash-in appearance and increased peak-intensity on the ultrasonography. This wash-in appearance reduces the image quality provided because of the image stored in the previous process on the monitor screen. The increased peak-intensity is the increased of maximum contrast on ultrasound devices let the image looks not alike the real that need a reinterpretation on the reading. Study of Sun et al showed endoscopic ultrasound was the best follow up method to detect postoperative complications. Miedzybrodzki et al (2012) found the use of endoscopy in diagnosing GIST provide the sensitivity of 82%, speciﬁcity of 100%, positive predictive value of 100%, and negative predictive value of 58%, Stroszczynski et al (2005) found MRI was the best method to detect metastasis of GIST.

CT imaging showed the characteristics of CT such as central necrosis, heterogeneous enhancement, cavitation that provides gas–like feature within the tumor, and the absence of enlarged lymph nodes. While as MRI provides a better feature to detect invasion and metastasis due to the superiority of MRI in evaluation of soft tissue. The delineation of spatial relationship to surrounding structures denoting tumor extension. The multiplanar view provides by MRI may shows the origin of tumor, relationships to other organ and large blood vessels.

Selection of the modality to establish GIST is influenced by many factors. The anatomical site of tumor is an important one. In the anatomical region where the soft tissue is predominance, MRI and ultrasound provide a better imaging. In the area where the tumor is suspected to be in the posterior, then the endoscopic ultrasound referred to be superior. A typical tumor response determined based on the previous established criteria, including changes in tumor size and decreased number of intra–tumoral blood vessels. These changes were measured as the therapeutic response. A study of Abbeele et al showed important markers/proxies of the tumor metabolic changes. Decreasing tumor metabolic activity precedes the decrease of tumor size followed with the increased quality of life.

Conclusion

CT scan is a diagnostic modality for investigation uncomplicated GIST with high sensitivity and speciﬁcity (94.9% and 100%, respectively). Other modalities to be considered in advanced or with metastasis.

Conflict of interest

Author disclose there was no conﬂict of interest.

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