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Original Article

Evaluation of the clinical utility of liver MRI T2* as a surrogate marker in liver iron overload: Experience from a Malaysian haematology referral centre

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Abstract

Introduction: Thalassaemia significantly contributes to the disease burden in Southeast Asia, particularly due to complications such as liver iron overload from long-term blood transfusions. The assessment of liver iron overload moves from liver biopsy towards non-invasive methods by utilizing MRI T2* technique. This study evaluated the clinical utility of MRI T2* as a gold standard for assessing hepatic iron overload, and investigated its correlation with serum ferritin and other clinical parameters.

Materials and Methods: A one-year cross-sectional study was conducted on Thalassaemia patients who underwent MRI T2* in the year 2025. Liver iron concentration (LIC) was calculated using cvi-42 post-processing software and the serum ferritin levels, transfusion regimen, and demographic data were recorded. The relationships between T2* values, serum ferritin, and other clinical parameters were then analysed.

Results: A total of 158 Thalassaemia patients, predominantly transfusion-dependent, were enrolled. HbE-Beta Thalassaemia was the most common subtype (48.1%), followed by Beta-Thalassaemia Major (24.7%). Severe liver iron overload was observed in 63.3% of patients, with Malay patients exhibiting higher severity than Chinese patients ($p<0.001$). Serum ferritin levels showed a strong negative correlation with liver T2* values (Rs = -0.699, $p < 0.001$) However, the type of Thalassaemia, transfusion duration and regimen were not significantly associated with T2* values or LIC.

Conclusion: Liver MRI T2* demonstrated an effective assessment of hepatic iron overload, exhibiting a strong correlation with serum ferritin levels. These findings elucidate the reliability of MRI T2* imaging to be utilized in the management of transfusion-related iron overload.

Keywords: Ferritin, Iron, Liver iron concentration, Malaysia, MRI T2*, Thalassaemia.

Introduction

Haemoglobin disorders represent a significant global health burden, with 71% of 229 countries reporting a substantial prevalence. Notably, these countries account for 89% of all live births worldwide, of whom 83% have sickle cell disorders and 17% have Thalassaemia [1]. These disorders impact 89% of newborns worldwide, with approximately 330,000 newborns affected annually, Thalassemia, a hereditary haematological disease identified nearly a century ago, is characterized by ineffective erythropoiesis and requires regular blood transfusions to prevent severe anaemia and maintain adequate haemoglobin levels [2]. According to Weatherall et al., Thalassaemia is most prevalent in the tropical belt [3], with high incidences reported in populations from the Mediterranean Basin, the Middle East, the Indian subcontinent, Southeast Asia, Melanesia, and the Pacific Islands, including Malaysia [4]. The Malaysian Thalassemia Registry (MTR) 2019 reported 8,681 registered thalassemia patients in Malaysia, revealing that a majority, exceeding 50%, presented with transfusion-dependent thalassemia (TDT) [5].

Transfused iron is deposited first within the reticuloendothelial cells prior to parenchymal iron loading within the heart and liver [6], and this begins as early as one year after the initiation of treatment [7]. Multiple organs are susceptible to excessive iron accumulation, with the liver being the most affected, followed by the myocardium and endocrine glands [8]. While other organs, such as the pancreas, brain, and additional endocrine glands, may also be impacted, the liver and myocardium are among the most commonly monitored sites. Local guidelines recommend serum ferritin measurement for the assessment of iron overload, with iron chelation therapy initiated when serum ferritin levels exceed 1000 µg/L [9].

If left untreated or managed with inadequate chelation, chronic iron overload in the liver can lead to liver fibrosis and cirrhosis, increasing the risk of developing hepatocellular carcinoma [10]. Consequently, regular monitoring of iron overload and ensuring the adequacy of iron chelation therapy are crucial, as emphasized by the Malaysian Ministry of Health, particularly through the utilization of MRI T2*. According to the Malaysian Clinical Practice Guideline for the Management of Thalassaemia, MRI T2* assessment is recommended every 1–2 years for patients who are not receiving chelation therapy, and every 6–12 months for patients undergoing chelation therapy [9]. Prior investigations have explored the use of MRI for assessing hepatic iron concentration; however, in 2005, St. Pierre et al. introduced MRI T2* as a novel, non-invasive method for quantifying liver iron concentration [11]. They outlined the methods, MRI parameters, and image analysis techniques, establishing T2* value categories calibrated against liver biopsy findings. This breakthrough became a cornerstone in global Thalassaemia management. Later, a comprehensive 10-year study by the Thalassemia Longitudinal Cohort, involving North American and British patients in year 2012, further highlighted the critical role of MRI in assessing and monitoring liver iron concentration (LIC) [12].

Despite the increased availability of MRI facilities in Malaysia, comprehensive data on MRI T2* for LIC assessment from treating centres remain limited. Only one state out of the 14 has provided limited data on the use of MRI T2* to monitor liver iron overload, as reported in the latest MTR [5, 6]. Therefore, this study aims to contribute valuable findings and data on the role of MRI T2* in quantifying hepatic iron overload, particularly within the largest Malaysian cohort of patients with TDT.

Materials and methods

Study design and study population:
This is a cross-sectional study employing a universal sampling method, with samples obtained over one year period from January 2025 to December 2025. We included all patients who underwent MRI examinations for LIC assessment. This study was conducted at Hospital Ampang, the national referral centre for adult haematological disorders treating the highest number of thalassaemia patient in Malaysia. The cases included individuals with hemoglobinopathies, primarily Thalassaemia, who had received blood transfusions and were experiencing iron overload. Exclusion criteria consisted of patients who underwent MRI T2* for purposes other than LIC assessment, as well as those with concurrent liver lesions or malignancies. Assuming a 30% prevalence of severe iron overload among thalassaemia patients in Malaysia and a total population of approximately 800 patients at our center, the adjusted sample size required for the study, with a 95% confidence level and 5% precision, was 188.

Patients were selected based on the inclusion and exclusion criteria from the Picture Archiving and Communication System (PACS). MRI T2* values, along with demographic data, blood parameters, and transfusion history, were retrieved from the E-Hospital Information System (E-HIS) for further analysis.

As this study was considered as a human study, we adhered to the principles outlined in the Declaration of Helsinki. This study was approved by the Malaysia National Medical Research Registry and Medical Research Ethics Committee.

Image acquisition:
The MRI scans were performed by qualified radiographers with over 10 years of experience, using a 1.5T United Imaging uMR570 MRI machine (2020 Shanghai United Imaging Healthcare Co., Ltd, China). A torso coil was used to minimize signal drop and ensure signal homogeneity throughout the scanning area. Non-ECG gated 'white blood' imaging was performed at the level of the upper abdomen in free breathing for topographic purposes. Following this, T2* imaging of the liver was conducted using a single breath-holding technique. Liver images were acquired in the axial plane at eight different echo times (TE) in millisecond (ms) intervals to evaluate the magnitude and rate of signal decay.

The scanning parameters were as follows: Time of Echo (TE) ranging from 0.98 to 6.23 ms, repetition time (TR) maintained at 7.39 ms throughout the scan, flip angle set to 20 degrees, field of view (FOV) of 300-400 x 200-300 mm, matrix size of 132 x 340 pixels, slice thickness of 2.0 mm, and bandwidth of 1500 Hz. The total scan time varied depending on the patient's ability to cooperate with breath-holding. Post-processing analysis was conducted using specialized software (Thalassemia-Tools; Cardiovascular Imaging Solutions, cvi42, London, United Kingdom) to measure the T2* value. Two regions of interest (ROIs), with an elliptical size of 3 - 4 cm2 were placed either the right or left lobe (preferably the right lobe) in the axial plane at the porta hepatis level to calculate the T2* value, generating a signal decay versus time graph. The ROIs also needed to avoid of vessels, bone or air. The corresponding LIC was then generated (Figure 1). This approach was based on the study by Hernando D et al. [13], with the right lobe selected due to its signal homogeneity and reduced susceptibility to breathing motion artefacts.

Image analysis:
Based on the two ROIs (purple and green), the T2* value and corresponding signal decay curve were generated using the post-processing software CVi42. Identical T2* values and overlapping signal decay curves from both ROIs indicate that the selected regions are representative of the liver iron concentration (LIC) (Figure 1). The corresponding LIC, were classified into the following categories: normal (<2 mg/g), light (2-7 mg/g), moderate (8-15 mg/g), and severe (>15 mg/g) iron load as outlined by St Pierre in 2005 [11].

Serum ferritin:
The most recent serum ferritin level, measured within six months before the MRI date, was recorded for analysis to ensure accuracy in comparison with the T2* values. Serum ferritin serves as a clinically relevant biomarker of total body iron stores at the time of assessment. Despite this, its interpretation should be approached with caution, particularly in the presence of acute inflammation, underlying hepatitis, or when ferritin levels are markedly elevated.

Hemoglobinopathies, transfusion history, and iron chelation therapy:
This information for each study participant was obtained from the E-HIS and recorded. Hemoglobinopathies were classified into five categories based on the previous MTR: Beta-Thalassaemia Major, Beta-Thalassaemia Intermedia, HbE-Beta Thalassaemia, HbH Disease, and other hemoglobinopathies.

Transfusion history, including the duration of transfusion, transfusion frequency, and the type of iron chelation therapy, was also recorded. The duration of transfusion was calculated from the date of the first transfusion and expressed in years. The transfusion regimen was categorized into three groups: ≤6 weekly, >6 weekly, and Non-Transfusion

Dependent (NTD). Following the previous MTR, iron chelation therapy was categorized as follows: desferrioxamine (DFO), deferiprone (DFP), deferasirox (DFX), a combination of two or more iron chelators, and no chelation therapy. For statistical purposes, these parameters were recategorized as detailed in Tables 1 and 2.

Statistical analysis:
Data were analysed using the Statistical Package for Social Sciences (SPSS) version 24.0 [IBM Corp. Released 2023. IBM SPSS Statistics for Macintosh, Version 29.0.1.0 Armonk, New York: IBM Corp]. Descriptive statistics were used to assess demographic and clinical data. Normality tests were performed on continuous variables, and appropriate non-parametric tests were applied where necessary. A p-value of <0.05 was considered statistically significant.

Results

Table 1. *Clinical characteristics of the patients (n=158).*

Variables	n (%)	Mean (SD), or Median (IQR)
Gender		
Male	57 (36.1)	
Female	101 (63.9)	
Age (year)		
Mean (SD)		30.7 (11.75)
< 18	14 (8.9)	
18 - 29	66 (41.8)	
30 – 39	53 (33.5)	
40 – 49	19 (12.0)	
> 50	6 (3.8)	
Race		
Malay	129 (81.6)	
Chinese	29 (18.4)	

Variables	n (%)	Mean (SD), or Median (IQR)
Type of Thalassaemia		
Beta-Thalassaemia Major	39 (24.7)	
Beta-Thalassaemia Intermedia	8 (5.1)	
HbE-Beta Thalassaemia	76 (48.1)	
HbH Disease	10 (6.3)	
Other Hemoglobinopathies	25 (15.8)	
Duration of transfusion (year), n=115		
Mean (SD)		19.3 (10.26)
< 10	27 (23.5)	
10-19	28 (24.3)	
20-29	38 (33.1)	
> 30	22 (19.1)	
Transfusion regimen		
≤ 6 weekly	111 (70.3)	
> 6 weekly	26 (16.5)	
NTD	21 (13.2)	
Patient on iron chelator		
DFO only	20 (12.7)	
DFP only	72 (45.6)	
DFX only	7 (4.4)	
Combination therapy	42 (26.6)	
Not on iron chelator	17 (10.8)	
Serum Ferritin level, (ng/mL)		
Median (IQR)		1.57 (2.40)
Min - max		0.30 – 24.00
Liver iron concentration (LIC), mg/g		
Mean	28.30	
Median	23.26	
Min - max	0.81 – 106.00	
Severity of LIC		
Normal	8 (5.1)	
Light	17 (10.8)	
Moderate	33 (20.9)	
Severe	100 (63.3)	

Table 2. *Liver iron concentration in relation to demographics, types of hemoglobinopathy and transfusion parameters (n=158).*

Variables	Liver iron concentration (LIC)		*p*
	Non-Severe [normal, mild, and moderate] (n, %)	Severe	
Gender			
Male	16 (28.1)	41 (71.9)	0.323
Female	42 (41.6)	59 (58.4)	
Age (year)			
< 18	7 (50.0)	7 (50.0)	
18 - 39	45 (37.8)	74 (62.2)	0.239
> 40	6 (24.0)	19 (76.0)	
Race			
Malay	38 (29.5)	91 (70.5)	<0.001
Chinese	20 (69.0)	9 (31.0)	
Type of Thalassaemia			
Beta-Thalassaemia	45 (36.6)	78 (63.4)	
Alpha-Thalassaemia	3 (30.0)	7 (70.0)	0.856
Other Hemoglobinopathy	10 (40.0)	15 (60.0)	
Duration of transfusion (year), n=115			
< 10	8 (29.6)	19 (70.4)	
10-19	13 (46.4)	15 (53.6)	0.372
20-29	13 (34.2)	25 (65.8)	
> 30	11 (50.0)	11 (50.0)	
Transfusion regimen			
≤ 6 weekly	41 (36.9)	70 (63.1)	
> 6 weekly	8 (30.8)	18 (69.2)	0.691
NTD	9 (42.9)	12 (57.1)	
Patient on iron chelator			
Monotherapy	32 (32.3)	67 (67.7)	
Combination therapy	18 (42.9)	24 (57.1)	0.319
Not on iron chelator	8 (47.1)	9 (52.9)	

Table 3. *Non-parametric correlation between the MRI T2* and serum ferritin and liver iron concentration (n=158).*

Variables	Median (IQR)	r	*P*
Serum Ferritin, (ng/mL)	1584.5 (2090.0)	-0.699	< 0.001
MRI T2* value	1.57 (2.40)		
Liver Iron Concentration, (mg/g)	23.26 (35.76)	-0.982	< 0.001
MRI T2* value	1.57 (2.40)		

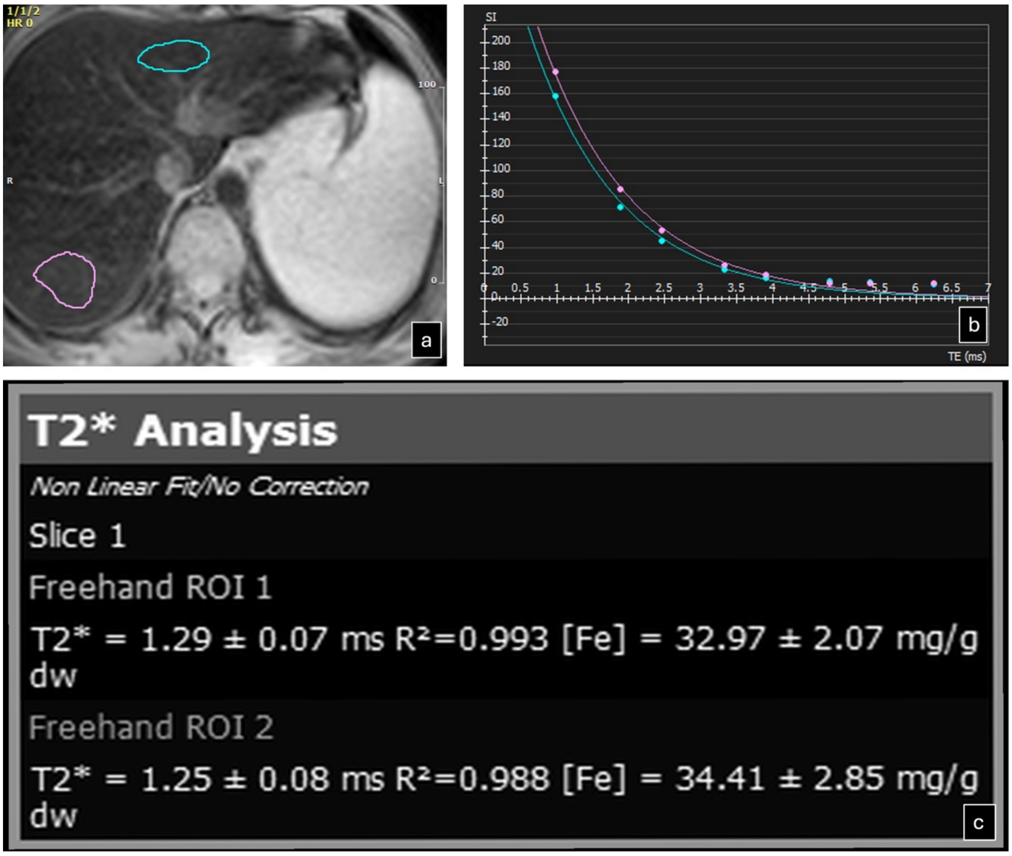

Figure 1. *Example of post-processing data images using cvi42. (a) The ROI (purple and green) was placed at the right or the left lobe of the liver, where the region must be devoid of vessels, bone or air. (b) The signal intensity at these regions in eight different echo time (TE) was automatically plotted and subsequently, the T2* value with its corresponding R2 and liver iron concentration (in mg/g) were expressed. (c) The T2* value for each ROI was expressed with +/- standard deviation, along with its corresponding LIC.*

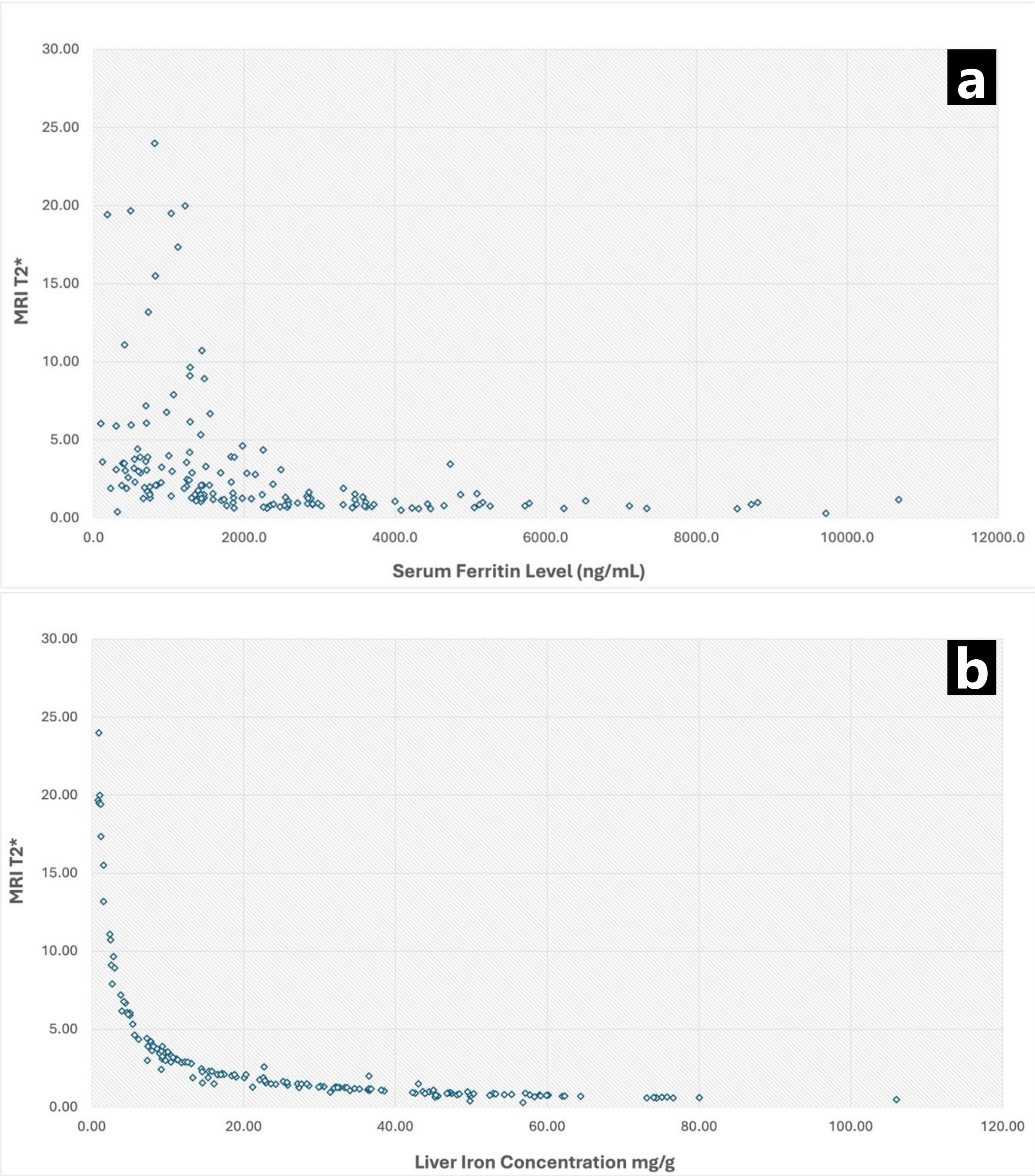

Figure 2. *Scatter plots of MRI T2* values versus serum ferritin levels (a) and liver iron concentration (b) in 158 patients demonstrated significant, strong negative correlations for both relationships.*

Demography:
A total of 158 MRI T2* of the liver studies were performed throughout the study period regardless of the type of hemoglobinopathy, comprised of 57 male (36.1%) and 101 female patients (63.9%). The mean age was 30.7 years with the youngest and oldest cases being 7 and 73 years old respectively. The majority of cases were from the 18-29 years old group (41.8%). In this study, most thalassemia patients were of Malay ethnicity (81.6%, n=129), followed by Chinese ethnicity (18.4%, n=29). Notably, no patients of Indian ethnicity were represented in this study.

The most common type of Thalassaemia encountered was HbE-Beta Thalassaemia which was 48.1% (n=76) followed by Beta-Thalassaemia Major at 24.7% (n=39). While HbH disease and Beta-Thalassaemia Intermedia contributed to 6.3% (n=10) and 5.1% (n=8) respectively. Other rarer types of hemoglobinopathies were also encountered, such as HbH Constant Spring, Adana + Constant Spring, and other heterozygous hemoglobinopathies, which collectively contributed to 15.8% (n=25) of all patients.

Transfusion regimen:
The total duration of transfusion (in years) was classified into several categories: <10 years, 10-19 years, 20-29 years, and >30 years. However, the documentation on the total duration of transfusion was only available in 115 out of 158 patients, where the mean, SD duration of transfusion was 19.3,10.26 years. The majority of patients had received transfusions for 20-29 years (n=38, 33.1%). The shortest duration was one year, and the longest was 41 years.
According to the MTR 2019, regular transfusion was defined as the requirement for packed red blood cell transfusions at least once every six weeks to maintain optimal haemoglobin levels [5]. The majority of the patients were receiving regular transfusion (70.3%, n=111) while only 26 patients (16.5%) were receiving more than 6-weekly packed cell transfusion. A minority of the cases (13.2%, n=21) were classified as NTD, with the majority of these patients diagnosed with the HbH subtype or other rare hemoglobinopathies.

Both duration of transfusion and transfusion regimen showed no significant correlation with the LIC, (p=0.372 and p=0.691, respectively) (Table 2).

Iron chelation therapy:
Among the 158 patients included in this study, the majority were receiving iron chelation therapy. Deferiprone (DFP) monotherapy was the most common regimen, used by 72 patients (45.6%). This was followed by combination therapy in 42 patients (26.6%) and deferoxamine (DFO) monotherapy in 20 patients (12.7%). A smaller proportion of

patients were treated with deferasirox (DFX) monotherapy (7 patients, 4.4%). Seventeen patients (10.8%) were not receiving any iron chelation therapy at the time of the study. However, the type of iron chelation did not show a significant association with the liver iron concentration (p = 0.319) (Table 2).

Serum ferritin:

All patients had the latest serum ferritin level recorded within 6 months of the MRI T2* examination. Serum ferritin levels were below 2500 ng/mL in 67.7% of the study population, with a median (IQR) of 1584.5 (2.4) ng/mL. A minority of patients (9.5%, n=16) demonstrated serum ferritin concentrations exceeding 5000 ng/mL. Notably, one patient (0.6%) presented with a markedly elevated serum ferritin level, surpassing 10000 ng/mL, and was diagnosed with diffuse large B-cell lymphoma (DLBCL) involving the bone marrow.

MRI T2*:

The T2* values were divided into four categories based on previously established research (10). The T2* value corresponds to the LIC, which is measured as the weight of iron (in milligrams, mg) in each gram of dry liver tissue (in gram, g). The mean LIC in patients was 28.3 mg/g where most of the patients have severe iron overload (63.3%, n=100), followed by moderate iron load (20.9%, n=33), light iron load (10.8%, n=17), and normal iron load (5.1%, n=8).

Liver iron concentration:

MRI T2* value was inversely proportional to the liver iron concentration in a negative exponential manner (Figure 2(b)), as the iron deposition in the liver parenchyma alters the MRI T2* relaxation time (13). Based on the MRI T2* value with its corresponding LIC, we categorized the cohort into four categories: normal, mild, moderate, and severe. In Table 2, using the Chi-Square Test, the correlation between the LIC categories and gender, age, and ethnicity is shown. There was no significant correlation between gender or age and LIC. There was a significant strong correlation between LIC and ethnicity ($p<0.001$), indicating that patients of Chinese ethnicity presented with less severe hepatic iron overload than those of Malay ethnicity. After adjustment for confounders were made including gender, age group, transfusion duration, and chelation therapy using binary logistic regression, Chinese ethnicity remained significantly associated with a lower likelihood of severe liver iron overload compared to Malay patients (adjusted odds ratio = 0.079, 95% CI: 0.078 to 0.045, $p < 0.001$).

The type of Thalassaemia and total duration of blood transfusion were not significantly different among the groups of patients. We noticed that among our patients who had been receiving blood transfusions for more than 30 years, 50% (n=11) of patients had severe liver iron overload and another 50% (n=11) had from mild and moderate liver iron load. Similarly, the transfusion regimen did not show a significant correlation with the degree of LIC.

Correlations between the MRI T2* values with serum ferritin and LIC values:
The liver MRI T2* values ranged from 0.30 to 24.00 ms (median 1.57, IQR 2.40). The median serum ferritin level is 1584.5 ng/mL, ranging from 95.1 to 10682.4 ng/mL with an interquartile range (IQR) of 2090.0 ng/mL. The correlation coefficient (r) is -0.699, indicating a significant, strong negative correlation with the MRI T2* value (p-value < 0.001).

The LIC ranged from 0.81 to 106.00 mg/g with an interquartile range (IQR) of 35.76 mg/g. As expected, LIC demonstrated a strong inverse correlation with MRI T2* ($r = -0.982$, $p < 0.001$).

In summary, both serum ferritin and liver iron concentration show strong negative correlations with MRI T2* values, with liver iron concentration exhibiting an even stronger negative correlation than serum ferritin. From these findings, the total body iron load, demonstrated by the serum ferritin and liver iron concentration were reflected by the shortening of liver parenchyma T2* relaxation time.

Discussion

Thalassemia is a prevalent inherited haematological disorder in this region, particularly within the Thalassemia Belt, which encompasses the Mediterranean, Middle East, and Southeast Asia, including Malaysia [4]. Although local clinical guidelines and a national disease registry have been established, the latest Malaysian Thalassemia Registry lacks comprehensive MRI T2* data. This deficiency stems from the delayed implementation of MRI as a non-invasive diagnostic modality for liver iron overload in Malaysia, a practice that has gained prominence only in the last decade, replacing the previously established gold standard of liver biopsy.

Gender:
Based on a large systematic analysis conducted by Tuo Y. et al. [14] and the latest local registry [5], there is no gender predilection among Thalassaemia patients as it is attributed to the non-sex chromosome involvement in globin chain synthesis. This is also supported by Hoe HG et al. from local data, which shows equal gender involvement [15]. In contrast, our study showed a disparity in gender involvement, where 36.1% and 63.9% of patients are male and female respectively. This is possibly because our cohort consisted only of the patients who underwent MRI examinationand therefore does not represent the whole Thalassaemia patients in our centre.

Although both genders demonstrated severe liver iron overload, there is no significant association between the genders in determining the degree of LIC. Similar to a study done by Khadivi and co-workers in 2021, there was no significant difference between the degree of LIC with the gender [16].

Ethnicity:
The three major ethnicities in Malaysia are Malays, Chinese and Indians followed by other smaller ethnics. In this cohort, it is not surprising that Malays dominate the number of patients (81.6%) followed by Chinese. This is consistent with findings by Alwi ZB et al. where he reported 62% of Thalassaemia patients in his cohort are Malays, followed by Chinese and Kadazan-Dusuns [17]. Similarly, Mohd Ibrahim et al. reported 64.0% of Thalassaemia patient in Malaysia were Malays followed by Chinese (17.5%) and Kadazan-Dusuns (11.36%). Although Indians made up the third largest ethnicity in Malaysia, the number of Indians affected by Thalassaemia is low; less than 1% [5] while in our study, no Indians were recorded. This is possibly because the ancestors of Indian ethnicity in Malaysia originated from South India, which rarely had α-thalassaemia or β-thalassaemia [16].

An interesting finding in our cohort was the Chinese had a significantly lower number of severe liver iron overload as compared to other races. There was a strong, significant correlation between the LIC and ethnicity ($p<0.001$) where the Chinese had less severe liver iron overload as compared to the Malays. To our knowledge, there is no specific study looking into the factors contributing to this pattern. A small number of Chinese ethnicities in our cohort may not be representative of all Thalassaemia patients in Malaysia; therefore, further studies with larger sample sizes are needed to confirm this correlation. Furthermore, only 115 patients have their record on the duration of blood transfusion that included in the analysis.

MRI T2* with serum ferritin and LIC:

Until the last two decades, MRI T2* has become the gold standard in determining liver iron overload and hospitals in Malaysia have started to utilize this tool within the past decade [9]. The calibration of T2* relaxation time with the degree of iron deposition in the histological specimens became the foundation of this technique [11], and the safety of this method has been well established by Angelucci et al. in their large study [19]. Recently, the neighbouring countries have also started to utilize MRI for evaluation of liver iron overload [20].

There are significant limitations of MRI for this purpose, particularly in a developing country including Malaysia in terms of cost, patient logistics, machine availability and long-waiting MRI appointment. These factors force the utilization of serum ferritin as the indicator for monitoring hepatic iron overload, a method considered second-best after biopsy in some centres. This resulted in lacking MRI T2* data being recorded in the previous Thalassaemia Registry [5]. Our cohort, being the first comprehensive data from the second largest centre in treating Thalassaemia patients has shown promising results, in line with the previously published data.

The MRI T2* value significantly correlated with the serum ferritin ($p<0.0001$, r -0.699) indicating the accuracy and reliability of the technique used in our centre, in line with evidence from neighbouring countries [20]. The results presented indicate a significant negative correlation between serum ferritin levels and liver iron concentration with MRI T2* values with a correlation coefficient (r) of -0.699 with a p-value of < 0.001. In conclusion, the serum ferritin levels increase, the MRI T2* values decrease, reflecting greater liver iron overload.

Similarly, the liver iron concentration showed an even stronger correlation ($r = -0.982$, $p < 0.001$) with MRI T2* values. This suggests that liver iron concentration is a critical factor in determining MRI T2* values, which are used to assess tissue iron levels non-invasively.

When comparing these findings to previous literature, several studies have established the relationship between serum ferritin, liver iron concentration, and MRI T2* values. For instance, studies have shown that elevated serum ferritin is a reliable marker for iron overload conditions, such as hemochromatosis and thalassemia, where MRI T2* is utilized to quantify liver iron concentration. These findings support the notion that MRI T2* is a valuable tool for assessing iron overload, correlating well with both serum ferritin and liver biopsy results [11, 21-22]. The negative correlation coefficients suggest that MRI T2* can serve as a non-invasive alternative to liver biopsy for evaluating iron burden, which is particularly beneficial in clinical settings where biopsy may pose risks or be impractical.

Limitations:
Only 158 samples were enrolled in this study due to several limitations such as machine breakdown and patients not turning up for MRI appointments. This smaller sample size represents a limitation of this study, as it may have reduced the statistical power and affected the precision and generalizability of the results. Although the achieved sample size was slightly lower than the calculated requirement, the study still included a substantial proportion of the eligible patient population at our center.

Another limitation is the unequal distribution of ethnicity and the degree of liver iron overload in our cohort which may lead to bias in the data analysis.

Conclusion

This study reinforces the established understanding of the relationship between serum ferritin, liver iron concentration, and MRI T2* values. The strong correlations observed highlight the utility of MRI T2* as a diagnostic tool in managing patients with iron overload, supporting findings from previous research in the field. Further studies could explore the implications of these findings in clinical practice, particularly in monitoring treatment efficacy in iron overload disorders. Whenever possible, monitoring of other susceptible organ for iron overload especially the myocardium, should be routinely performed in correlation with LIC. In a limited-resource centre, there is a need for more simplified and cost-effective methods to assess iron overload, particularly in TDT patients, the exploration of novel imaging modalities remains a significant research priority.

Conflict of interest

There is also no conflicts of interest between the authors which may affect the quality of this research and writing of this manuscript.

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