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Original research article

Space occupying lesions in solid organs: A single centre longitudinal study

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Abstract

Introduction: The liver is a primary hub for space-occupying lesions (SOL), detected through advanced imaging technologies. While benign liver lesions often require no immediate intervention, the rising prevalence of hepatocellular carcinoma (HCC) and cholangiocarcinoma (CCA) demands thorough evaluation. Understanding clinical, biological, and radiological aspects of liver lesions is crucial. Comparatively, splenic lesions, less common than in other organs, range from asymptomatic to critical cases. Advanced imaging and surgical technologies enhance identification, yet a universal protocol for splenic lesions is lacking. Our study explores the varied etiologies, symptomatology, and distinctive management strategies for SOL in the liver and spleen, proposing a tailored algorithm based on current literature.

Methodology: A two-year longitudinal study conducted in KIMS hospital, Bhubaneshwar delves into liver and spleen SOLs, homogenizing for specificity. Inclusion criteria target hepatic and splenic SOL, excluding other organs. Data collection involves history, examination, laboratory analysis, and imaging (ultrasound, CT, MRI), analyzed statistically for comprehensive exploration.

Results: The cohort (n=157, mean age 50.52 years, male-predominant) exhibits diverse SOL types, with prevalent metastatic malignancies (40.13%) and hepatic abscesses (33.76%). Primary sources of metastasis include gallbladder, biliary tree, pancreas, and colorectal region. Management varies from palliation to interventions like ERCP, chemotherapy, and PTBD. Detailed characteristics and size specific management of abscess inform tailored patient care.

Conclusion: The study illuminates' diverse distribution of SOL and their management in our centre. Beyond academia, findings guide practical patient management and foster future research in space-occupying lesions of liver and spleen.

Keywords: Space-occupying lesions, Liver, Spleen, Longitudinal study, Management.

Introduction

Among the solid organs, liver is the commonest site for space occupying lesions (SOL) [1]. Imaging technologies like USG, CT and MRI have paved way for increased discovery of various SOL's even in otherwise asymptomatic patients [2, 3, 4]. (2) (1) (3) (2) (4) (3) Even though benign lesions are ubiquitous and requires no further treatment, surgeryis performed in cases which are symptomatic and risk of malignant transformation [5, 6]. (5) (4) (6) (5) The concern for malignancy like hepatocellular carcinoma (HCC) and cholangiocarcinoma (CCA) which are emerging in developing countries demands a thorough evaluation [7, 8]. Thus, it is important to have substantial knowledge of clinical, radiological and pathological characteristics of each liver lesion [9, 10].

Splenic lesions are not common compared to lesions in other solid organs [11]. They are encountered in patients ranging from asymptomatic to critically ill [12, 13]. They are broadly divided into lymphoid and non-lymphoid tumors [11]. Clinical factors namely immune status, trauma, known malignancy, associated chest findings, infection, etc. may narrow the differentials [13]. Advancement in radiological imaging and surgical technologies led to discovery of more splenic abnormalities especially solid and cystic lesions [12, 13]. Biopsy might be required only when primary diagnosis is uncertain or nonspecific for given diagnosis. Surgery is warranted for symptomatic and demanding patients [12, 13]. However, there is no accepted standard protocol for approaching splenic lesions [14]. (14) (6)

Myriad of SOL's in solid organs necessitate a feasible algorithm for management of these lesions. With this entity, we studied various aetiologies of SOL in liver and spleen and their symptomatology, investigations and their different management in our centre. Based on current literature, we also emphasize on management algorithm for SOL.

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Methodology
This study employed a longitudinal design, spanning a duration of two years, from August 2021 to August 2023. The research was conducted at KIMS, a tertiary care center renowned for its comprehensive medical services and a diverse patient population. A total of 157 cases were recruited based on inclusion and exclusion criteria.

Inclusion Criteria
The study included patients with diagnosed space-occupying lesions specifically localized in the liver and spleen.

Exclusion Criteria
Patients presenting with space-occupying lesions in organs other than the liver and spleen were excluded from the study.

Data Collection
The comprehensive analysis of patient data involved information regarding patients' history, including any pre-existing conditions, prior treatments, familial predispositions and clinical examination. Utilizing imaging modalities including ultrasound, CT, and MRI for accurate lesion characterization, size determination, and evaluation of associated features. Evaluating the various therapeutic interventions employed for patients with SOL, ranging from conservative management to surgical interventions.

Study Analysis
This observational analytical study employed statistical analysis to interpret the collected data. Categorical variables were presented as frequencies and percentages (% of cases), providing insights into distribution of various characteristics within the cohort. Continuous variables were expressed as mean and standard deviation (SD), offering a quantitative overview of the central tendency and variability of relevant parameters.
The meticulous data analysis and statistical approach contributes valuable insight on center specific dynamics of space-occupying lesions in the liver and spleen adding points to existing body of knowledge in this field.

Result
The study cohort, comprising 157 individuals with space-occupying lesions (SOL) in the liver and spleen, demonstrated a mean age of 50.52 years, reflecting a diverse range of patients. The male predominance was notable, with 120 males and 37 females (Table 1). The categorization of SOL types unveiled a varied landscape (Table 2), where metastatic lesions (40.13%) emerged as the most prevalent, followed by hepatic abscess (33.76%).

Primary malignancy of liver
Among 5 cases, 3 were given palliative care; one patient underwent chemotherapy and the other had TACE procedure done.

Sources of Metastatic Lesions
Gallbladder (GB): The study identified 22 cases where metastatic lesions originated from the gallbladder. This finding underscores the propensity of gallbladder malignancies to metastasize to liver, indicating the need for heightened vigilance in patients with gallbladder pathologies.

Biliary Tree: Metastatic lesions originating from the biliary tree constituted 8 cases. The inclusion of the biliary tree as a significant source emphasizes potential for spread from structures closely associated with the liver.

Pancreas: 8 cases in metastatic malignant lesions reveal pancreatic malignancies' dissemination to neighbouring organs, making it inoperable.

Colorectal Region: 8 cases of metastatic malignancies highlight colorectal cancers' potential to extend beyond the primary site, affecting organs like the liver.

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Management Strategies for metastatic lesions

Palliative measures, employed in 26 cases, emphasize the challenges posed by advanced malignancies. In deteriorated conditions (8 cases), individualized care plans addressed worsening health status, emphasizing dynamic patient-specific management. Endoscopic Retrograde Cholangiopancreatography (ERCP) in 7 cases signifies its relevance in managing certain lesions involving the biliary and pancreatic systems.

Chemotherapy's role in managing metastatic lesions (6 cases) aligns with contemporary systemic treatment practices, aiming to slow disease progression and improve overall survival. Percutaneous Transhepatic Biliary Drainage (PTBD) in 6 cases highlights its utility in relieving biliary obstruction, particularly when lesions impact bile flow which necessitate drainage to alleviate symptoms and improve liver function.

In 5 cases, palliative surgery was done to relieve the obstruction and to improve symptomatology of the patient.

In addition to these management strategies, 3 patients had Self-expanding metallic (SEM) stent for improving patients' symptomatology; 1 underwent radiotherapy and one case had PTBD along ERCP stenting for cholangiocarcinoma.

Management of other SOL's in liver and spleen

Table 3illustrates space-occupying lesions within the study cohort, categorizing them into liver abscess, spleen abscess, both liver and spleen abscess, hepatic cyst, splenic cyst, and hydatid disease.

Of 53 cases studied with liver abscesses exhibit considerable variability, ranging from 2.0 to 15.0cm in size, with an average of 6.94cm and a standard deviation of 3.2665. 20 were managed conservatively, 5 underwent USG guided aspiration, 25 had USG guided pigtail catheterization according to their presentation, size and location. 1 patient underwent laparoscopic drainage due to rupture. Other 2 had ERCP stenting due to biliary communication.

Out of 10 patients with splenic abscess, 4 were managed conservatively; 3 were treated with aspiration; 2 were diagnosed with tuberculosis and started on anti-tubercular drugs. 1 patients detoriated due to severe sepsis.

Among 4 cases of both liver and splenic abscess, 3 were treated conservatively and the other patient underwent pigtail drainage.

Table 4: ANOVA for Variable SIZE based on Procedures:

The ANOVA results indicate a significant overall difference in SIZE based on the type of procedures performed. The Between Groups section highlights substantial differences among procedures, with a high F-value (24.024) and a p-value of .000.

Table 5: LSD Test for Multiple Comparisons:

The LSD (Least Significant Difference) test compares mean differences between procedures. Notably, the mean difference between Pigtail catheterization (1.0) and Aspiration (2.0) is not significant ($p = .210$). However, the mean difference between Pigtail catheterization (1.0) and Other procedures (3.0) is significant ($p = .002$), indicating a substantial difference in SIZE. Similarly, significant differences are observed between Aspiration (2.0) and other procedures (3.0) with a p-value of .000.

The ANOVA results confirm an overall significant difference in SIZE based on the type of procedures performed. The LSD test further specifies that Pigtail catheterization and Aspiration do not differ significantly in SIZE. However, both Pigtail catheterization and Aspiration differ significantly from other procedures, emphasizing the significant difference in results in patients who had pigtail catheterization and aspiration compared to other treatment.

Hydatid diseases display a more homogeneous size distribution, with a mean size of 8.0cm and a minimal standard deviation of 1.4142. Patients with biliary communication underwent ERCP stenting and symptomatic patients underwent surgery or PAIR according to lesion size and site.

Other cystic lesion was 11 in number comprising of 10 liver cyst (6-simple hepatic cyst; 4-polycystic liver) and 1 simple splenic cyst. All cases were subjected for observation except for 3 cases of simple hepatic cyst who were symptomatic underwent USG guided aspiration, pigtail catheterization and surgery respectively.

Out of 6 haemangiomas, 4 were of liver and other 2 were splenic lesion. 3 patients underwent surgery all of them had lesion size more than 10cm.

Discussion

Imaging techniques like CT scans are highly accurate in diagnosing space-occupying lesions, making them a preferred choice. While biopsy remains gold standard for most diseases, it can often be avoided if other tests (blood work, clinical exam, and imaging) provide sufficient information for diagnosis.[1]The findings of this single-center longitudinal study on space-occupying lesions (SOL) in solid organs offer a rich foundation for a comprehensive discussion that delves into the implications, clinical relevance, and avenues for future research.

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Demographic Distribution and Lesion Types

The cohort, with a mean age of 50.52 years and a distinct male predominance, highlights key demographic characteristics of patients with space-occupying lesions (SOL). Notably, these lesions are most commonly observed in the 7th decade of life. Comparisons with studies conducted by Eva-Maria *et al*., Abou-Shady *et al*., and Dardik reveal mean ages of 64.7, 48, and 66.5 years, respectively [15, 16, 17]. The observations of Abou-Shady *et al*. align closely with the present study [16]. This consistency in findings supports existing literature indicating that SOLs predominantly affect individuals in their middle to later years, showing male predominance.

The high prevalence of metastatic lesions (40.13%) commonly diagnosed in the 6th decade of life. Consistent with this, studies by Sheefa *et al*., and Edris *et al*., reported mean ages of 55.5, 57.7, and 59.4 years, respectively, similar to the present study [18, 19]. Metastatic lesions reveal a diverse primary source, emphasizing the complexity of metastatic patterns. Gallbladder, biliary tree, pancreas, and colorectal region contributions were higher compared to other sites like stomach, breast, endometrium and unknown. This insight is pivotal for vigilant monitoring, especially in patients with gallbladder pathologies or colorectal cancers with potential metastasis.

The study presents distribution of space-occupying lesions (SOL) and their sizes in Tables 2 and 3. Table 3's interpretation nuances understanding; liver abscesses show considerable size variability, while hydatid diseases exhibit a more homogeneous distribution. These insights guide clinicians in comprehending size variations within each lesion category for tailored patient care.

Table 4, featuring the Analysis of Variance (ANOVA) for the SIZE variable based on different procedures, underscores the substantial impact of chosen interventions on lesion dimensions. The marked overall difference in SIZE accentuates the influential role on their management. Further insights into specific procedure effects on SIZE variations are gleaned from the LSD test results outlined in the Table 5.

The procedural guidelines are outlined as follows: for Abscesses, conservative management is recommended for sizes less than 5 cm, while sizes greater than 5 cm warrant Aspiration or the use of a Pigtail Catheter; Hemangiomas less than 5 cm and asymptomatic are advised for conservative management, whereas those exceeding 5 cm and causing symptoms call for surgery, whether open or laparoscopic; Hydatid Cysts less than 5 cm benefit from conservative management, sizes ranging from 5 to 10 cm involve PAIR (Puncture Aspiration Injection Reaspiration), and symptomatic cases, irrespective of size, necessitate surgery; for Hepatic Cysts, asymptomatic cases of any size lean towards conservative management, while symptomatic cases, regardless of size, prompt Aspiration, Drainage, or Surgery.

Additionally, Figure 1 and 2 provide a visual representation of the various approaches to liver and splenic masses, enhancing the comprehensive understanding of the presented guidelines and procedures.

Table 6

The study by Rajiv Sonarkar et al. delves into liver SOL, exploring etiologies, clinical presentation, imaging correlations, treatment modalities, and outcomes [1]. Another pertinent study, "Space Occupying Lesions in the Liver," examines clinical manifestations and evaluation methods in pediatric liver lesions, stressing the significance of imaging modalities like ultrasound, CT, and MRI. Discussion on serological markers, including AFP, acknowledges interpretation challenges. The study underscores the necessity of tissue diagnosis for guiding management based on histology and anatomy in pediatric liver tumors, shaping treatment strategies and prognosis [20]. These references enrich the study's context, offering a holistic understanding of the complexities in space-occupying lesions in solid organs.

Conclusion

Our study sheds light on the distribution of various SOL in liver and spleen; commonest being metastasis followed by liver abscess. Majority of SOLs in liver and spleen are incidental diagnosed radiologically. Due to delayed presentation, it is difficult to diagnose such lesions earlier. A deep investigation on management strategies of SOLunraveled the complexities, emphasizing the need for tailor-made treatment according to the patient’s presentation. Palliative measures, chemotherapy, surgery and procedures such as pigtail catheterization, aspiration, PAIR, ERCP, and PTBD highlight the diverse toolkit available to clinicians. From our centre, we suggest forimage guided drainage for abscess more than 5cm and symptomatic patients. Palliative measures for metastatic lesions. Cystic lesions like hydatid can be treated with medical/ PAIR/ laparoscopic approach depending on their symptoms, size and characteristics on imaging. Other cystic lesions can be observed until symptomatic and risk of malignancy.Any symptomatic haemangioma or size more than 10cm can be resected.

Table 1: Social demographic details

Age		
Age	**Mean**	**Standard Deviation**
	50.53	15.64
Sex		
Sex	**Number**	**Frequency**

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Male	120	76%
Female	37	24%

Table 2: Distribution of Space-Occupying Lesions in Solid Organs

Type of SOL	No. of cases	Percentage
Malignant (primary HCC)	5	3.18%
Malignant (metastatic)	63	40.13%
Hepatic abscess	53	33.76%
Splenic abscess	10	6.37%
Both abscess	4	2.55%
Hydatid cyst	5	3.18%
Other cysts	11	7.01%
Haemangioma	6	3.82%
Total	157	100.0

Table 3: Characteristics of Space-Occupying Lesions in Solid Organs

Type of ABSESS	Number of Patients	Minimum Size	Maximum Size	Mean	Standard Deviation
Liver abscess	53	2.0	15.0	6.943	3.2665
Spleen Abscess	10	2.0	10.0	4.900	3.1780
both Liver and Spleen Abscess	4	2.0	6.0	4.250	1.7078
hepatic Cyst	10	1.0	9.0	4.909	2.3856
Hydatid Disease	5	7.0	10.0	8.000	1.4142

Table 4: Analysis of Variance (ANOVA) for Size Variation Based on Procedures in Space-Occupying Lesions (Pigtail catheterization, Aspiration, and Other procedures)

Size	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	304.766	2	152.383	24.024	.000
Within Groups	405.950	64	6.343		
Total	710.716	66			

The Between Groups section indicates significant differences among the procedures, with a high F-value (24.024) and a p-value of .000.

Table 5: Multiple Comparisons of Size Differences between Procedures in Space-Occupying Lesions

Dependent Variable: Size						
LSD						
(I) Proceduredone	**(J) Proceduredone**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
1.0	2.0	-1.2950	1.0230	.210	-3.339	.749
	3.0	3.2132*	.9897	.002	1.236	5.190
2.0	1.0	1.2950	1.0230	.210	-.749	3.339
	3.0	4.5082*	.6635	.000	3.183	5.834
3.0	1.0	-3.2132*	.9897	.002	-5.190	-1.236
	2.0	-4.5082*	.6635	.000	-5.834	-3.183
*. The mean difference is significant at the 0.05 level.						

Table 6: Distribution of Diagnoses Based on Imaging Modalities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	USG	72	45.5	45.5	45.5
	CT	60	38.5	38.5	84.0
	Others	25	16.0	16.0	100.0
	Total	157	100.0	100.0	

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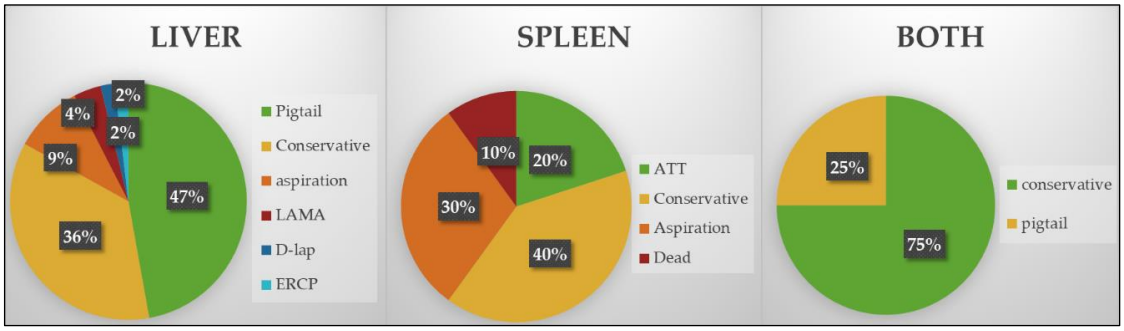
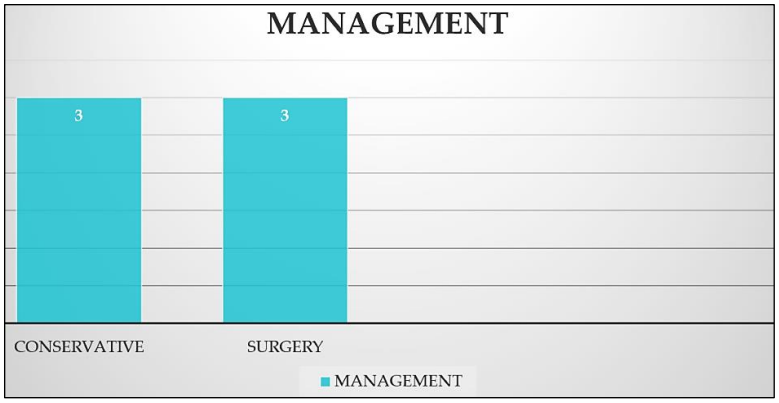
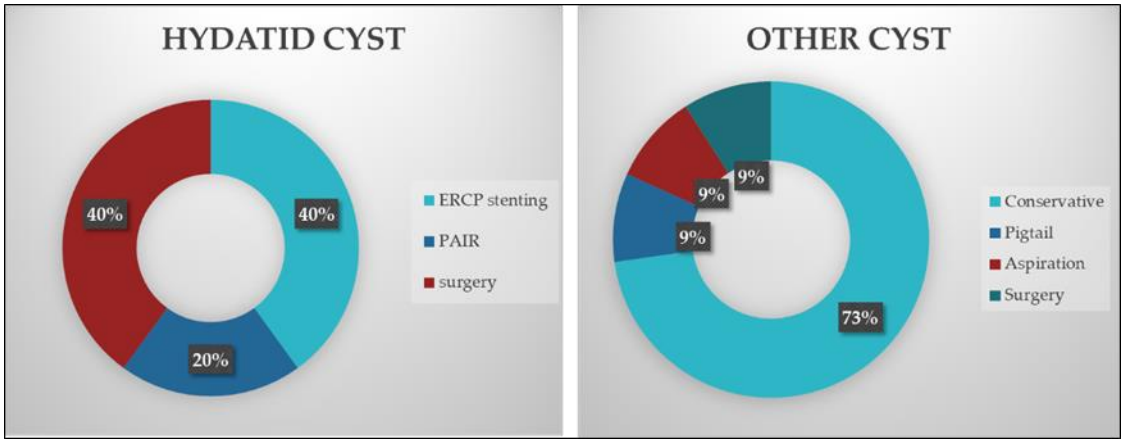
Graphs: Management of cases



Graph 1: Management Trends for Liver and Spleen Abscess



Graph 2: Management Trends for Haemangiomas



Graph 3: Management Trends for Hydatid Cyst and Other Cysts

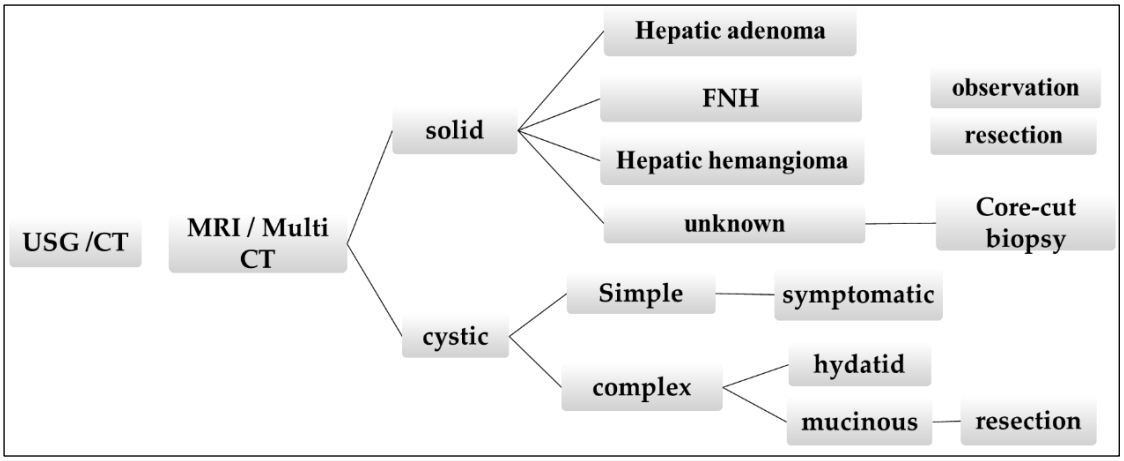


Fig 1: Strategies for Managing Liver Mass: A Visual Guide

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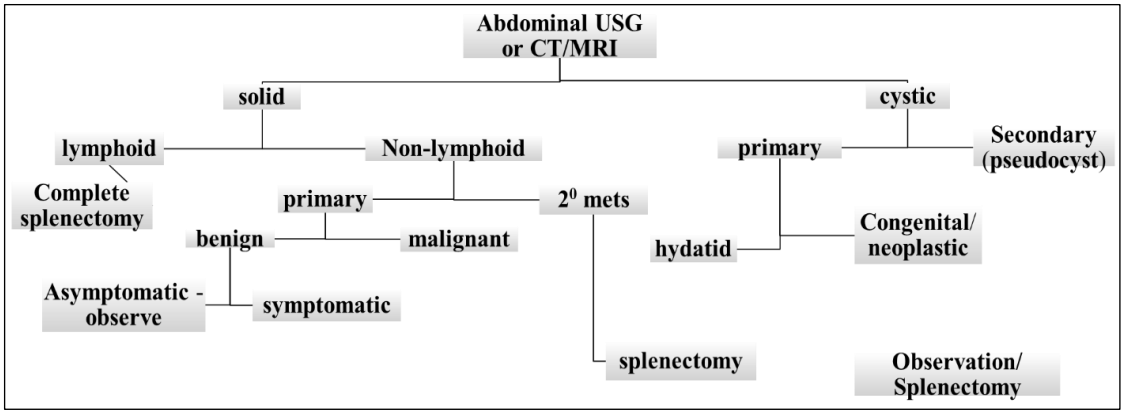

Fig 2: Strategies for Managing Splenic Mass: A Visual Guide

References

1. Sonarkar R, Gajendra G, Wilkinson TRV, Sonawane S. Space occupying lesions of liver-clinical presentation, investigations and management: a longitudinal study. Int. Surg. J. 2021;8:159-64.
2. Yeo CJ. Shackelford's surgery of the alimentary tract, e-book. Elsevier Health Sciences; c2017 Dec.
3. Belghiti J, Cauchy F, Paradis V, Vilgrain V. Diagnosis and management of solid benign liver lesions. Nat Rev Gastroenterol Hepatol. 2014 Dec;11(12):737-49.
4. Mavilia MG, Pakala T, Molina M, Wu GY. Differentiating Cystic Liver Lesions: A Review of Imaging Modalities, Diagnosis and Management. J Clin Transl Hepatol. 2018 Jun 28;6(2):208-16.
5. Marrero JA, Ahn J, Reddy RK. ACG Clinical Guideline: The Diagnosis and Management of Focal Liver Lesions. American Journal of Gastroenterology. 2014 Sep;109(9):1328-47.
6. Belghiti J, Dokmak S, Vilgrain V, Paradis V. in Blumgart's Surgery of the Liver, Biliary Tract and Pancreas Ch. 79A (ed. Jarnagin WR.) 1250-1267 (Elsevier Saunders); c2012.
7. Stoot JHMB, Coelen RJS, De Jong MC, Dejong CHC. Malignant transformation of hepatocellular adenomas into hepatocellular carcinomas: a systematic review including more than 1600 adenoma cases. HPB. 2010 Oct;12(8):509-22.
8. Bieze M, Phoa SSKS, Verheij J, Van Lienden KP, Van Gulik TM. Risk factors for bleeding in hepatocellular adenoma. British Journal of Surgery. 2014 May;101(7):847-55.
9. Cong WM, Dong H, Tan L, Sun XX, Wu MC. Surgicopathological classification of hepatic space-occupying lesions: A single-center experience with literature review. World Journal of Gastroenterology. 2011 May;17(19):2372-8.
10. Kochin IN, Miloh TA, Arnon R, Iyer KR, Suchy FJ, Kerkar N. Benign Liver Masses and Lesions in Children: 53 Cases over 12 Years; c2011. p. 13.
11. Morgenstern L, Rosenberg J, Geller SA. Tumors of the spleen. World J Surg. 1985 Jun;9(3):468-76.
12. Kamaya A, Weinstein S, Desser TS. Multiple Lesions of the Spleen: Differential Diagnosis of Cystic and Solid Lesions. Seminars in Ultrasound, CT and MRI. 2006 Oct;27(5):389-403.
13. Thut D, Smolinski S, Morrow M, McCarthy S, Alsina J, Kreychman A, *et al*. A diagnostic approach to splenic lesions Appl. Radiol. 2017;46(2):7-22.
14. Pang W Bo, Zhang T Chong, Chen Y Jun, Zhang J Zhe. Space-occupying benign lesions in spleen: experiences in a single institute. Pediatr Surg Int. 2009 Jan;25(1):31-5.
15. Kaltenbach TEM, Engler P, Kratzer W, Oeztuerk S, Seufferlein T, Haenle MM, *et al*. Prevalence of benign focal liver lesions: ultrasound investigation of 45,319 hospital patients. Abdom Radiol. 2016;41(1):25-32.
16. Abou-Shady M, Zakaria H, Alwaraky M. Nonparasitic liver cysts: different treatment strategies. Egypt J Surg. 2016;35(4):438.
17. Dardik H. Solitary hepatic cysts. J Am Coll. Surg. 2001;192(6):804.
18. Christopher S, Kumar A, Achar S. Liver abscess various modalities of treatment and its clinical outcome. Int. Surg. J. 2016;3(4):1868-74.
19. Utility of FNAC in conjunction with cell block for diagnosing space-occupying lesion (SOL) of liver with emphasis on differentiating hepatocellular carcinoma from metastatic SOL: Analysis of 61 cases. Oman Med J. Sheefa H, Lata J, Basharat M, Rumana M, Veena M. 2016;31(2):135-41.
20. Thyagarajan MS, Sharif K. Space Occupying Lesions in the Liver. Indian journal of pediatrics. 2016;83(11):1291-1302. https://doi.org/10.1007/s12098-016-2240-x