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ORIGINALARTICLE

OPENACCESS

HistopathologicalStudyofSoftTissueTumorsinaTertiaryCareHospital

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OPENACCESS

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A B S TRA C T

Introduction: Soft tissue refers to non-epithelial tissue, Soft tissue is a specialized formof tissue derived from the mesenchymal component of the embryo. It includes adipose tissue, fibrous tissue, skeletal muscles, blood vessels, lymphatic vessels and peripheral nervous system and is exclusive of skin, bone, lymphoreticular system, glia and soft tissues of various parenchymal organs. Soft tissue tumors (STT) are categorized into benign, intermediate and malignant. The incidence of benign STT is higher when comparedtomalignant tumors.Histopathologyis considered the gold standard method for the diagnosis of soft tissue tumors. Different special stains along with Immunohistochemistry are applied to increase the diagnostic accuracy of soft tissue tumors.

Material and Method: The study was conducted on soft tissue tumors over the period from July 2022 to December 2023, with a total of 189 cases in the Department of Pathology.

Results: : A total of 189 soft tissue tumorbiopsy specimens were received in the pathology department including the age range 1 to 60 years and gender (Male/Female). Most common age group is 20-40 years (40.74%). Among them most of tumors are Benign 169(89.41%), some are Malignant 20(10.58%). The most common benign soft tissue tumor were Leiomyoma ,Lipoma , Hemangioma , Schwannoma and Lymphangioma, Angiomyolipoma, desmoid tumor, nodular fasciitis , glomangiopericytoma, benign fibrous histiocytoma. The most common benign softtissue tumor was Leiomyoma 74(39.15%), followed by Lipoma 40(21.16%).Benign soft tissuetumorsshowedfemalepreponderancewithpeakincidencein3rdand4thdecade.
Malignant tumor was Dermatofibrosarcomaprotuberance , malignant fibrous histiocytoma, liposarcoma, fibrosarcoma, leiomyosarcoma, smooth muscle tumor of uncertain malignant potential, epithelioid sarcoma, primitive neuroectodermal tumor, solitary fibrous tumor, undifferentiated sarcoma.

Conclusion: Benign softtissue tumors were relatively more common than the malignant tumors. Leiomyoma was the commonest benign soft tissue tumor followed by Lipoma. Histopathologicaldiagnosisofsofttissuetumorsisimportantforfurthermanagementof patients. Histopathological study along with IHC wherever necessary , should go hand in hand to make an effective and complete diagnosis of soft tissue tumors.

KeyWords:*Softtissuetumors,Benign,Malignant,Histopathologicalstudy, Immunohistochemistry.*

INTRODUCTION

Softtissuereferstonon-epithelialtissue;itissupportingtissuewhichareextraskeletalexcludingjoints,central

nervoussystem,skeleton,hematopoieticandlymphoidtissues.Softtissuetumorscanoccuratanyage[1].Ithasbeen

noted that the histological distribution of soft tissue tumors are rather specific for a particular age group at a particular anatomical site.[2,3]Both benign and malignant soft tissue tumors commonlypresent as a painless mass. Examples of soft tissues are Adipose tissue, Fibrous tissue, Vascular tissue, skeletal muscle tissue, Smooth muscle and Nerve sheaths.

Theyarisenearlyeverywherein thebody,themost important locationbeingthe extremities, trunk,abdominal cavity and head and neck region.[4]

Soft tissue tumor are categorized into benign, intermediate, malignant. The incidence of benign soft tissue tumors is higher when compared to malignant tumors.[5]

The aetiology of most benign and malignant tumors of soft tissue is unknown. In rare cases genetic and environmental factors, irradiation, viral infection and immunodeficiency are associated with the development of usually malignant soft tissue tumors.[6]

Soft tissue tumors are diagnosed by light microscopy and with the aid of special stain. Soft tissue tumors need through clinical evaluation supported by radiological evaluation. FNAC in addition plays a vital role in diagnosis of superficial mass. Histopathology is considered the gold standard method of diagnosis of soft tissue tumors. Different special stains like, Periodic Acid Schiff Reagent (PAS) stain, Masson's trichrome, Van Gieson, Reticulin stain and Immunohistochemistry is applied to increase the diagnostic accuracy of soft tissue tumors.[2]

WHO Classificationofsofttissuetumors[7]

- AdipocyticTumors
- Fibroblastic/MyofibroblasticTumors
- FibrohistiocyticTumors
- Smooth MuscleTumors
- Pericytic(Perivascular)Tumors
- SkeletalMuscleTumors
- VascularTumors
- Chondro-osseousTumors
- TumorsofUncertain Differentiation

- **Markersmostcommonlyusedtocorrelatewithhistogenesis[8]MA**

TERIALS AND METHODS

Antibodies	**Expressedby**
Vimentin	Sarcomas,Melanoma
Desmin	BenignandMalignantsmoothandskeletal muscletumors
Neurofilaments	Neuroblastictumors
Smoothmuscle Actin	BenignandMalignantsmoothmuscletumors,Myo fibroblastictumors
Myogenin,MyoD1	Rhabdomyosarcoma
S-100Protein	BenignandMalignantperipheralnervesheathtumors,cartilaginoustumors, Melanoma
Epithelialmembraneantigen	Carcinomas,Epithelioidsarcoma,Synovialsarcoma
CD34	Benignand malignant vasculartumors, solitaryfibrous tumors, Dermatofibrosarcomaprotuberans
CD99	Ewingsarcoma/primitiveneuroectodermaltumor
CD68	Macrophage,Fibrohistiocytictumors

It is a Case series of soft tissue tumors over a period of July 2022 - December 2023(1.5 year) with total number of 189 casesin department of pathology, SMIMER hospitalSurat.10 % Formalin fixed paraffinembedded blocks were prepared. Samples in histopathological laboratory receivied from different departments with proper identification, labelling in the form. This form contains other basic information such as name, age, sex, histopathology examination number, specimen number, date of sample collected, location of tumor, clinical presentation and other investigations. Tissue fixed in 10%buffered formalin. Grossing was carried out after tissue fixation. At least 4-5 sections from tumor and one from each margins was given.These sections were processed in automated tissue processor machine, and sections of a thickness of tissue 4-5 microns were taken with rotatory microtome and prepared for routine stain with hematoxylin and eosin to examine under light microscope for histopathological diagnosis.

Special stains such as Periodic acid Schiff reagent(PAS), Masson's Trichrome, Van Gieson, Reticulin stainand Immunohistochemistry was performedwherever needed to aid the diagnosis.

Table (1): Markers most commonly used to correlate with histogenesis.

Histogenesis	Markers
1- Mesenchymal (general)	Vimentin
2- Epithelial	Cytokeratin, Epithelial Membrane Antigen (EMA)
3- Smooth muscle	Desmin, actin (smooth muscle actin)
4- Skeletal muscle	Myoglobin
5- Fibrohistiocytic	Vimentin, CD68, factor XIIIa
6- Melanocytes	HMB45. S – 100 protein
7- Neuronal	S – 100 protein, glial fibrillary acidic protein
8- Endothelial	Factor VIII, CD_{34}, factor XIIIa
9- Neuroendocrine Ewing's sarcoma / PNET	Neuron-specific enolase (NSE), chromogranin, synaptophysin CD_{99}
PNET = primitive neuroectodermai tumor	

RESULTS

Atotal of189 casesofSoftTissue Tumorswerestudied.

Tabel:1 Genderwisedistributionof patientsin thestudygroups

Sex	No. of Cases	Percentage
Male	47	24.86%
Female	142	75.13%
Total	189	100%

Female142(75.13%)predominancewasseencomparedtomale47(24.86%).

Table2:Agewisedistribution ofpatients in the studygroups

Agewise distribution	Numberof patients	Percentage
<20years	15	7.93%
21-40years	77	40.74%
41-60years	73	38.62%
>60years	24	12.69%
Total	189	100%

Inourstudy40.74%ofthepatientswereintheagegroupin21-40years.Thesecondmostcommonagegroup affected was 41-60 years, comprising of 38.62%.

Theyoungestpatientinourstudywas2yearsofage andtheoldestwas70yearsof age.

Tabel:3 Tumorsaccordingto classification

SoftTissueTumors	No. of Cases	Percentage
Benign	169	89.41%
Malignant	20	10.58%
Total	189	100%

Table4: Benignand Malignantsofttissue tumors- genderwisedistribution

Softtissuetumors	Malecase	%	Femalecase	%
Benign	41	24.26	128	75.73
Malignant	06	30	14	70

Benignsoft tissuetumorwas slightlycommon in females128(75.73%)than males41(24.26%).

Table5: TumorsaccordingtoHistological type

Histological Type	No of cases	Percentage
Musculartissue	70	37.03%
Adipose tissue	40	21.16%
Fibroustissue	29	15.34%
Vascular tissue	27	14.28%
Nervetissue	16	8.46%
Gastrointestinalstromaltumour	01	0.52%
Undifferentiatedsarcoma	02	1.05%
Miscellaneous	04	2.11%
Total	189	100%

Inourstudymostofbenignsofttissuetumorsare ofMusculartissue(37.03%)followedbyadiposetissue(21.16%), Fibrous tissue (27%), Vascular tissue (14.28%) and Nerve tissue (8.46%).
MostcommontumorwasLeiomyomafollowedbyLipoma, Fibroma,HaemangiomaandSchwannoma.
Inourstudy,4caseswasreportedwithdiagnosisaswecouldnotgivedifferentiateddiagnosisbecauseoflimited immunohistochemistry.

Table6:Correlationofage with histo-pathologicallesionofsofttissue tumors

Histological type	Male cases	%	Female cases	%
Muscular tissue	00	00	70	100
Adipose tissue	15	37.50	25	62.50
Fibrous tissue	12	41.37	17	58.63
Vascular tissue	12	44.44	15	55.55
Nerve tissue	10	66.66	06	37.05
Gastrointestinal stromal tumor	01	100	00	00
Undifferentiated sarcoma	02	100	00	00
Miscellaneous	03	75	01	25

InourstudyMuscular(100%)andadiposetissue(62.50%)were commonlyseeninFemale.Nervetissueweremost commonly seen in Male (66.66%).

Table7: No ofcases ofsoft TissueTumors

Tumor	No. ofCases
Leiomyoma	70
Lipoma	40
Fibrolipoma	2
Schwannoma	9
Desmoidtumor	2
Neurofibroma	7
Hemangioma	15
Arteriovenousmalformations	3
Lymphangioma	2
NodularFasciitis	2
Glomangiopericytoma	3
Angiomyolipoma	1
Angiolipoma	1
BenignFibrousHistiocytoma	5
Fibromaoftendon sheath	3
Gastrointestinalstromaltumor	1
DermatofibromaSarcomatousProtuberance	4
SmoothMuscleTumorofUncertainMalignant potential	1
PrimitiveNeuroendodermalTumor	4
Leiomyosarcoma	2
Liposarcoma	1
Fibrosarcoma	2
Malignantfibrous Histiocytoma	2
UndifferentiatedSarcoma	1
UncertaindifferentiationofEpitheloidSarcoma	1
Solitaryfibrous Tumor	1
Miscellaneous	4

- **Grossimages forsofttissuetumors**

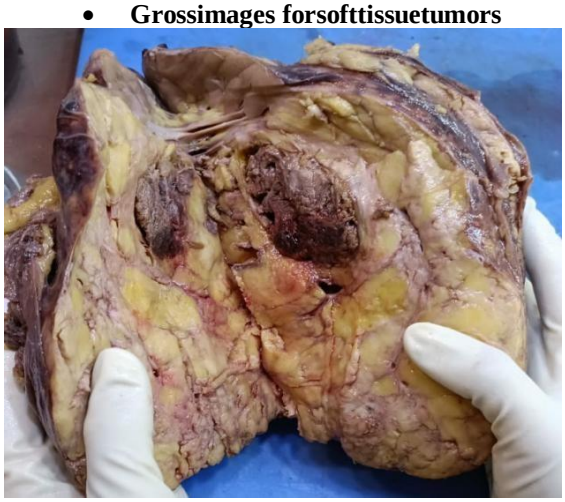


Figure1:Angiolipoma

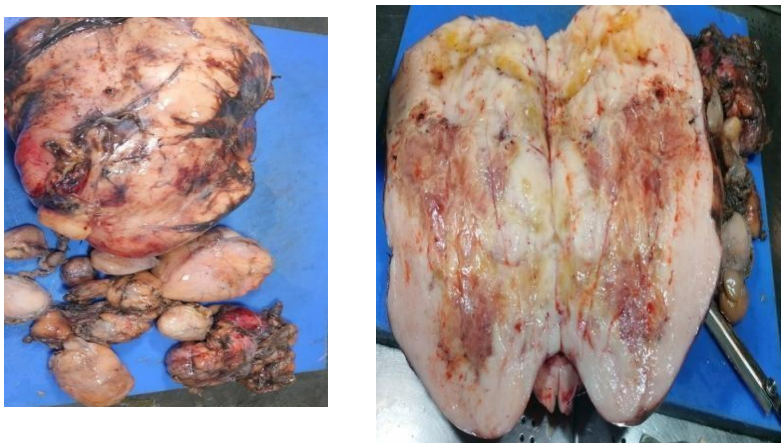


Figure2:Liposarcoma

Figure3:STUMP

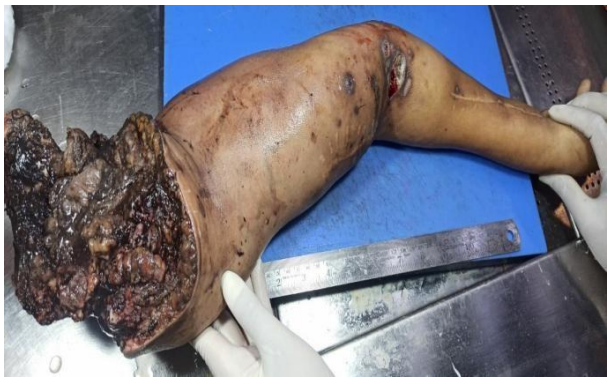


Figure4:Epitheloid Sarcoma

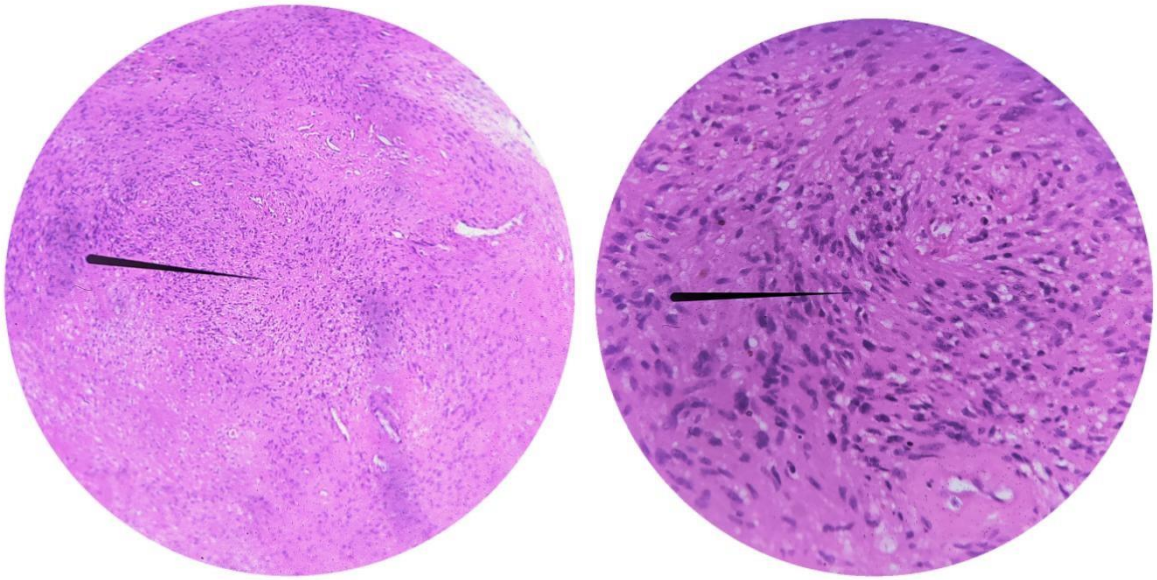


Figure1 :Schwannoma(H&E4X,40X)

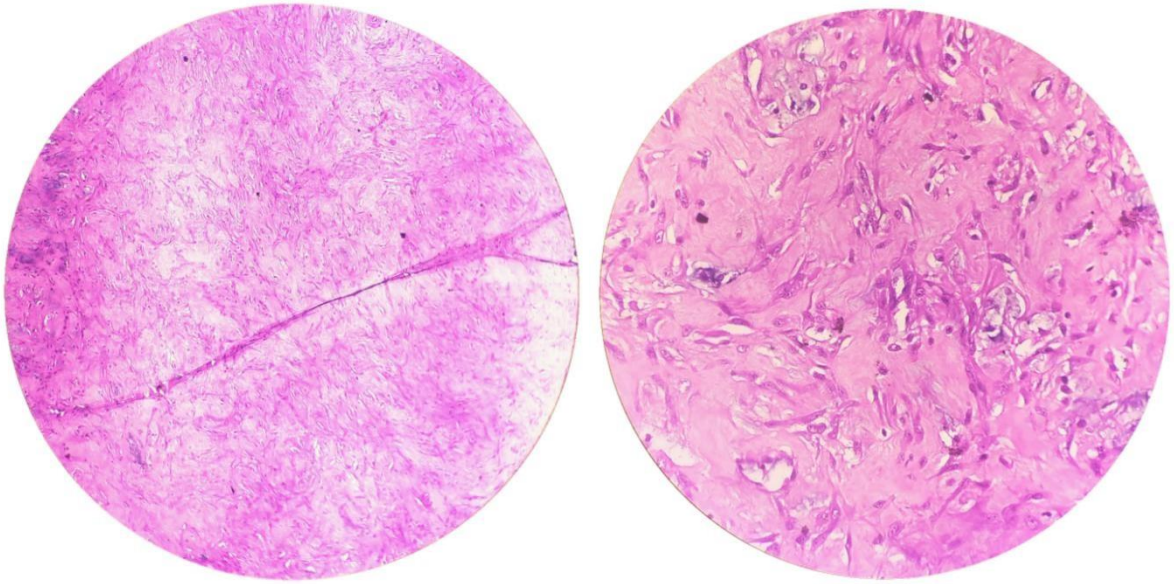


Figure2 :NodularFasciitis(H&E 10X,40X)

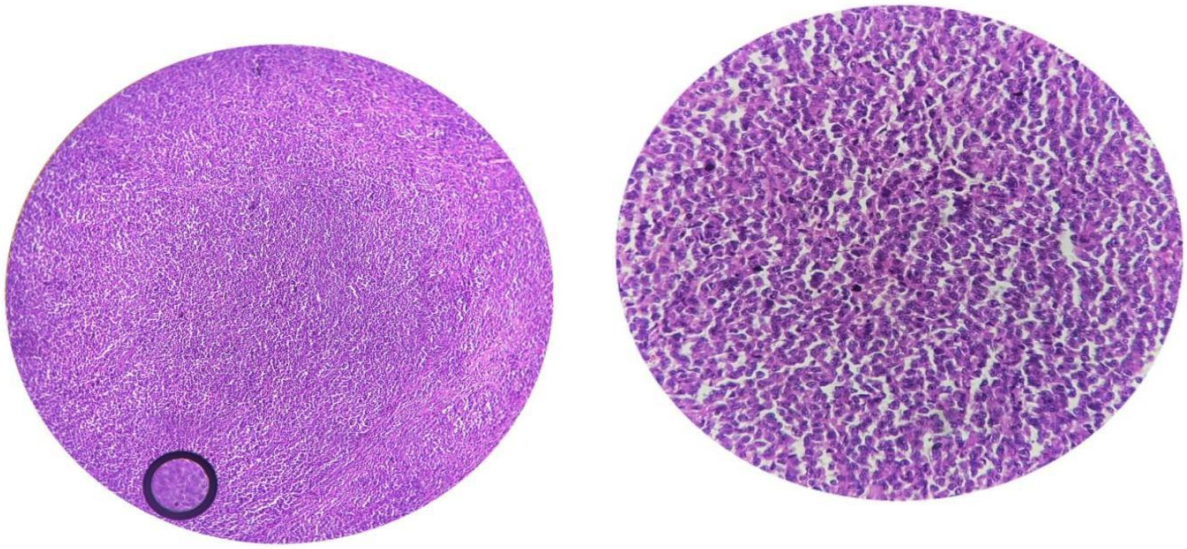


Figure3:PrimitiveNeuroectodermalTumor(H&E4X,10X)

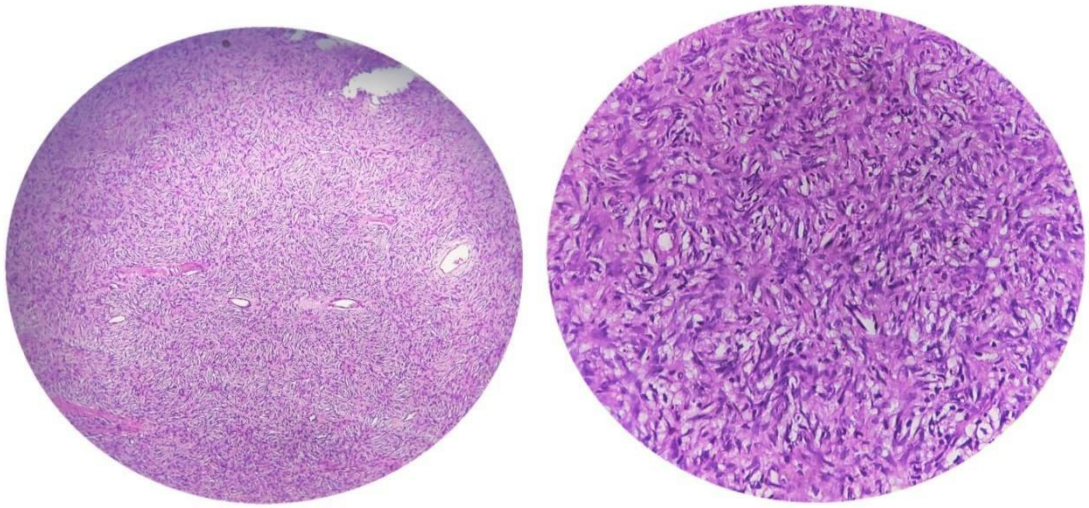


Figure4:DermatofibrosarcomaProtuberance (H&E4X,10X)

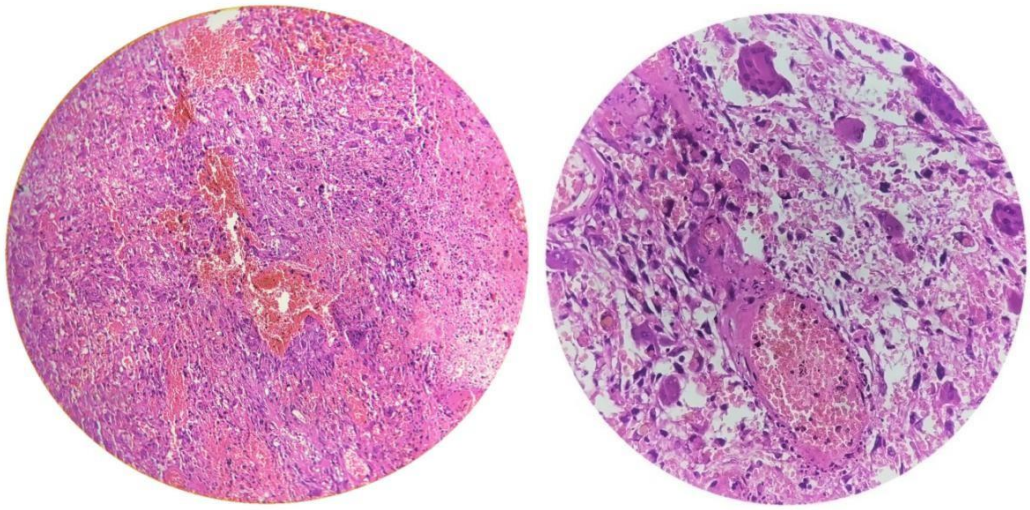


Figure5:MalignantFibrousHistiocytoma(H&E4X,40X)

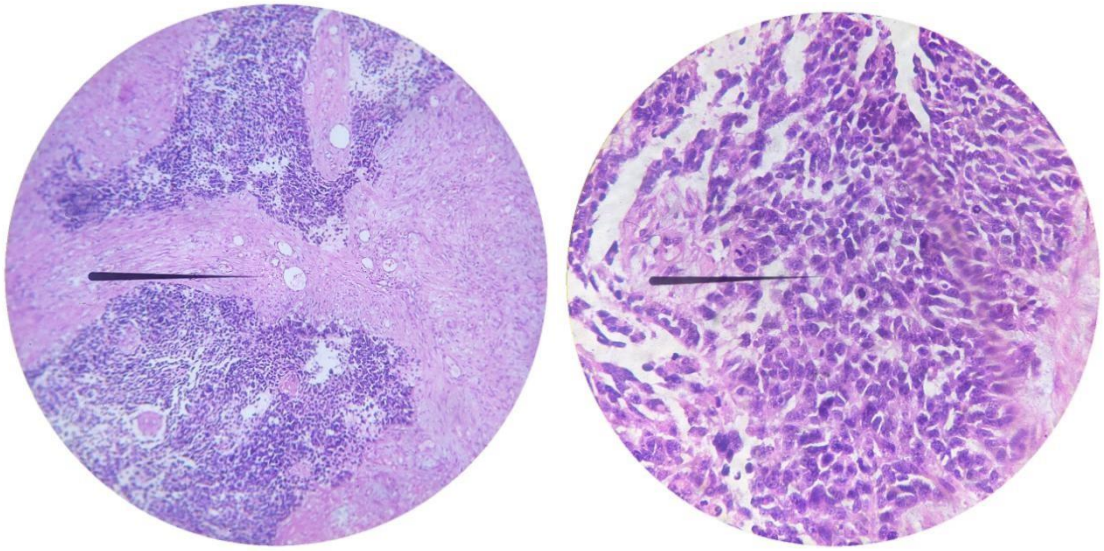


Figure6:UndifferentiatedSarcoma(H&E4X,40X)

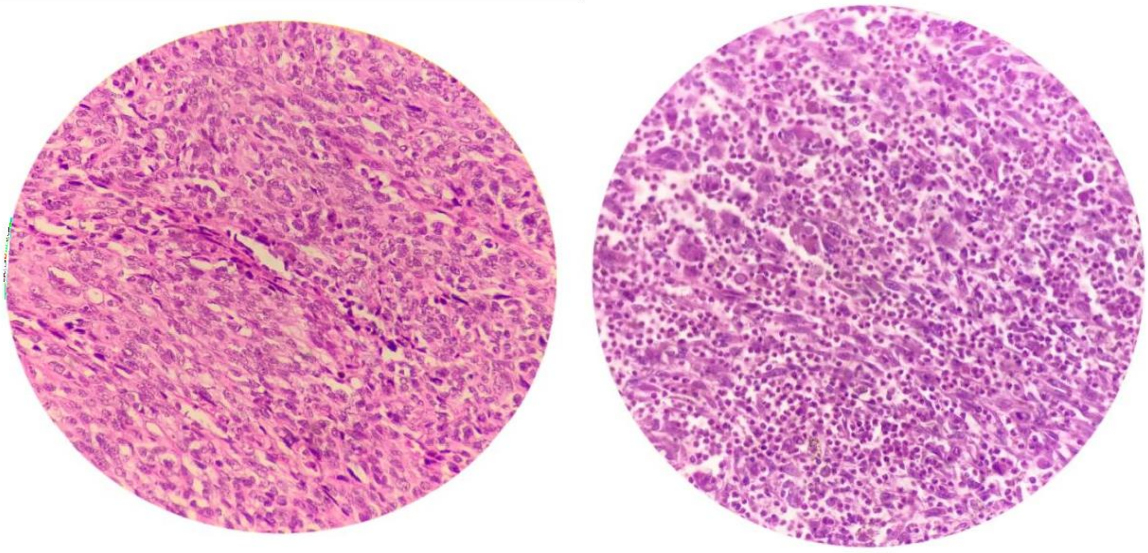
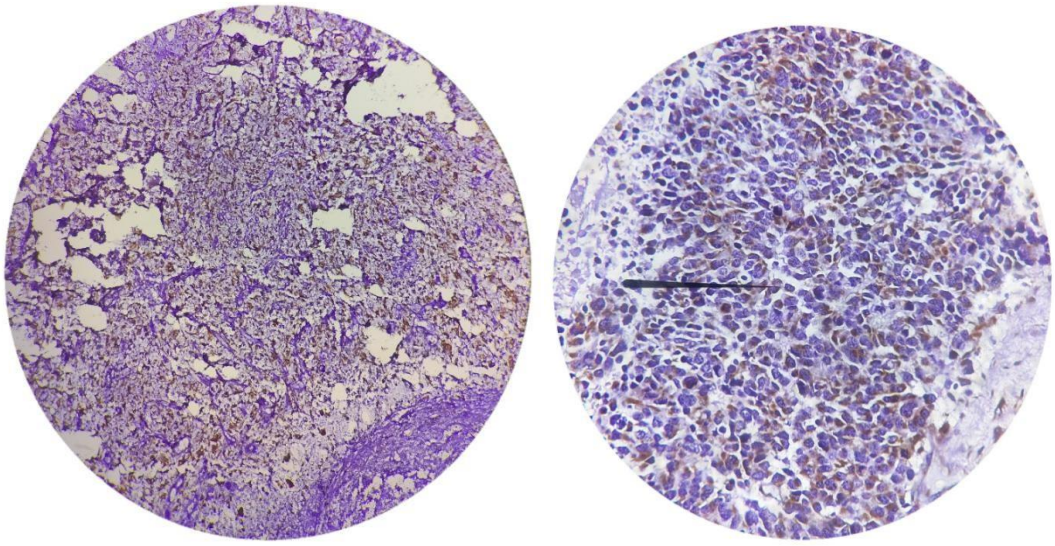


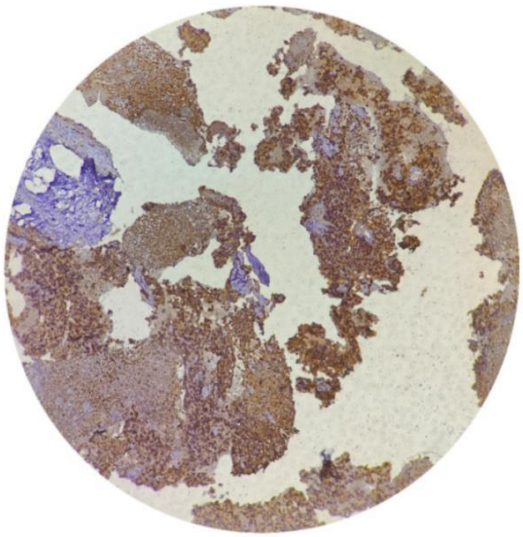
Figure 7: STUMP(H&E 40X) **Figure7:EpithelioidSarcoma(H&E40X)**

IMMUNOHISTOCHEMISTRY



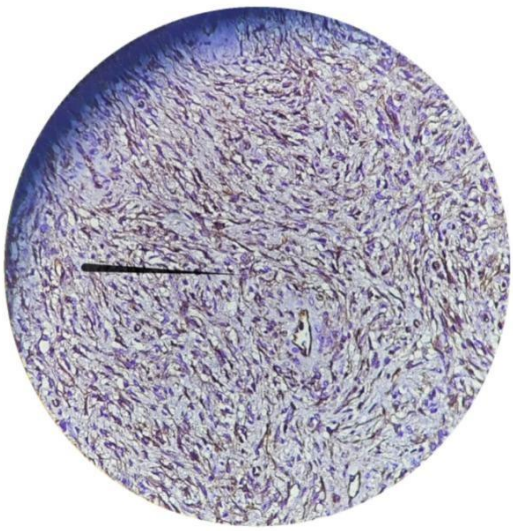
MalignantFibrousHistiocytoma(CD68positivity)
(CytoplasmicPositivity)

UndifferentiatedSarcoma(Vimentin positivity)
(MembranousPositivity)

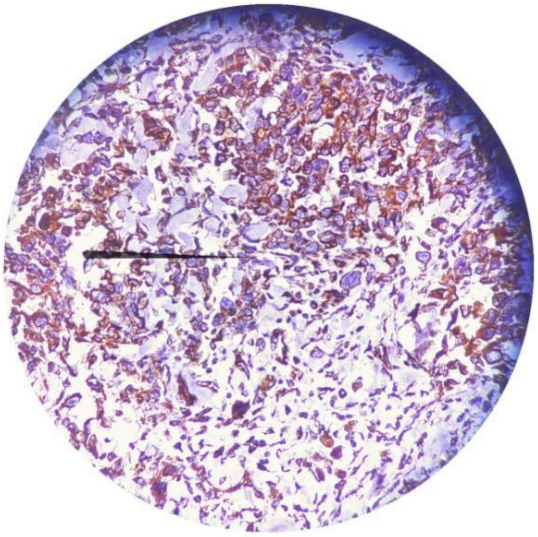


PNET(CD99positivity)

(MembranousPositivity)



DFSP(CD34 positivity)
(MembranousPostivity)



Epithelioidsarcoma(Vimentinpositivity) (Membranous Positivity)

DISCUSSION

EnzingerF.M&W.WWeiss, MyhreJensonet al.[11]Reportedanincidence ofsoft tissuetumorsas<2% respectively.

Soft tissue tumors are diagnosed in excisional biopsy of tumormass and it is most appropriate method of diagnosis of soft tissue tumors. The histological diagnosis and grading is mandatory as it has therapeutic and prognostic relevance.[12]

Soft tissue tumors constitute a large and heterogeneous group of neoplasm that involves muscles, fat, fibrous tissue with their supplying vessels and peripheral nerves.

Soft tissue tumor is a disease of the adult occurring most commonly in person between 20-60(40.74%) years of age except few types occur in young children.

Howeverthestudywas restrictedto documentationtheinformation about incidence,sex,age, andsitedistribution of soft tissue tumors and confirming the morphological diagnosis with special stains and Immunohistochemistry.

Soft tissue tumors vary from most common Benign soft tissue (89.41%) Leiomyoma followed byLipoma, Haemangioma, Schwannoma.

Among benign tumors leiomyoma was most commonly seen in females and very common in uterus followed by hemangioma and Lipoma while in male most common was Lipoma followed by schwannoma.

Inneuraloriginsofttissue tumorschwannomamostcommonthen neurofibroma.
Thustheincident ofBenign softtissue tumorsaremorecommon thanMalignant softtissue tumors.

In our study cases of fibrohistiocytic tumor were reported. In 4 cases of dermatofibrosarcoma protuberance, 2 cases of malignant fibrous histiocytoma , 1 case of fibrosarcoma.

In our study In malignant soft tissue tumors 2 cases of Leiomyosarcoma and 2 cases of STUMP(Uterine Smooth Muscle Tumor Of Uncertain Malignant Potential) ,liposarcoma , Malignant fibrous histiocytoma, Epithelioid sarcoma, Solitary fibrous tumorand Dermatofibrosarcoma protuberance, primitive neuroectodermal tumor.

Inourstudy,4 cases wasa nonsdiagnosisbecauseoflimitedimmunohistochemistryavailable.

Age/Sex	**Site**	**DifferentialDiagnosis**	**Immunohistochemistry**	**Advice for confirmation**
48Yr/Male	Umbilical Swelling	1) Solitaryfibrous tumor 2) Neurofibroma 3) Inflammatory MyofibroblasticTumor	S-100-ve CD34-ve	Vimentin SmoothMuscle Actin
35Yr/Female	Rightthigh swelling	1) Intraepidermalnevus-Spitz nevus 2) Benignfibroushistiocytoma	CD34 +ve	FactorIIIa
56Yr/Male	Rightthighmass	1) EpithelioidSarcoma 2) MalignantperipheralNerve Sheath Tumor	CK-focal positive EMA-focalpositive S100-Inconclusive	CD99 CA125
60Yr/Male	Swellingover nape of neck	1) Inflammatory MyofibroblasticTumor 2) Rhabdomyoma		Smoothmuscle actin Myoglobin ALK

Tumors	MarkerPositivity
DermatofibromasarcomatousProtuberance(DFSP)	CD34+
Malignantfibroushistiocytoma	CD68+, Vimentin+ , Actin +
EpithelioidSarcoma	vimentin+, CD 34 +
Fibrosarcoma	vimentin+,CD34+
Schwannoma,	S-100+(diffusestaining)
UndifferentiatedSarcoma	Vimentin + , CD 68 +
DedifferntiatedLiposarcoma	S-100+,SMA +
Primitiveneuroendodermaltumor	CD99 +
BenignfibrousTumor	Vimentin+
Leiomyoma	SMA+,Vmentin+,S100-
Hemangiopericytoma	CD34 +, SMA+

VariousImmunohistochemistryusedforVariousDaignosis

Soft tissue tumors are diagnosedin excisional biopsy of tumor mass and it is most appropriate method of diagnosis of soft tissue tumors. The histological diagnosis and grading is
mandatoryas ithas therapeuticand prognostic relevance.
IHCwasrequiredmostlyindiagnosisof softtissuetumors asadjacentto histology.

Rateof BenignSoftTissueTumors

Therateof benignsoft tissuetumors is 89.41% in thepresentstudywhich is in close accordanceto Gayatri Gogoi et al.[(1)](2017) whose study showed92.80% and Begum et al. [(5)]shows (2020) 92.2%.There is a variation from Simon Mulugeta Teferi et al.[(6)](2022) which showed 38.90%.

FrequencyofagedistributioninSofttissuetumors

In the present study, majorityof the soft tissue tumors were found in theage group of 21-40 years which resembles closely to the study conducted by Simon Mulugeta Teferi et al.[(6)](2022) and Begum et al.[(5)](2020)

Table1:FrequencyofBenign andMalignantSoftTissueTumors:

Authorand yearofstudy	Benign	Malignant
GayatriGogoi etal.[1](2017)	92.80%	7.60%
SimonMulugetaTeferi etal.[6](2022)	61.10%	38.90%
Begumetal.[5](2020)	92.2%	7.8%
Presentstudy	89.41%	10.58%

Table2:FrequencyofGenderwiseSoftTissueTumors:

Authorand yearofstudy	Male	Female
GayatriGogoi etal.[1](2017)	21% (183)	79% (611)
SimonMulugetaTeferi etal.[6](2022)	50.60% (121)	49.40% (118)
Begumetal.[5](2020)	51.00% (127)	48.99% (122)
Presentstudy	24.86% (47)	75.13% (142)

Table3:Comparison of Most commonagegroup ofSoftTissueTumors

Authorand yearofstudy	Agegroup
GayatriGogoi etal.[1](2017)	-
SimonMulugetaTeferi etal.[6](2022)	21 to 30 (28.00%)
Begumetal.[5] (2020)	21 to 40 (46.58%)
Presentstudy	21 to 40 (40.74%)

Table4:Comparison of histologicaltypes of SoftTissueTumors

Histologicaltype	GayatriGogoietal.[1](2017)	Simon Mulugeta Teferietal.[6](2022)	Begumetal.[5](2020)	Presentstudy
Musculartissue	55.70%	3.40%	00%	39.15%
Lipomatoustissue	10.40%	22.60%	64.30%	21.16%
Fibroustissue	6.90%	17.01%	8.40%	14.28%
Vascultissue	19.80%	29.40%	5.20%	13.75%
Nervetissue	6.70%	19.20%	19.70%	7.93%
Miscellaneous	0.50%	3.40	0.40%	3.70%

CONCLUSION

Benignsofttissuetumorswererelativelymorecommonthanthemalignanttumors.Leiomyomawasthecommonest benign soft tissue tumor followed by Lipoma.

MostofsofttissuetumorscanbediagnosedbyH&Estain.Insomecasesatypical presentationisseen,hencealong with help of clinical history and histopathological study, we canmake effective diagnosis, which helps us to decide the immunohistochemistrymarker panelfor the complete diagnosis of soft tissue tumor.

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