Ovarian mucinous neoplasms (benign/borderline/malignant), one of the common surface epithelial tumours of ovary, at times can be associated with mural nodules. These mural nodules can either be sarcomatous, sarcoma like or anaplastic carcinomatous. The nodules can be single or multiple and appear solid, white to brown in color. Sarcomatous nodules tend to occur in older patients and microscopically are poorly circumscribed, comprising of a population of pleomorphic spindled cells. Two cases of sarcomatous nodules associated with ovarian mucinous neoplasm are being presented here.

**Keywords:** Anaplastic, nodule, ovary, sarcomatous

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**INTRODUCTION**

Mucinous tumors of ovary arise from the surface epithelium and are classified as benign mucinous cystadenoma, atypical proliferative mucinous tumor and invasive mucinous carcinoma.[1] These mucinous neoplasms may rarely have mural nodules in their walls which are categorized as sarcomatous, anaplastic carcinomatous or sarcoma like mural nodules.[2] Amongst the three, anaplastic carcinoma nodules are the commonest. Seen mostly in postmenopausal women, these nodules have distinct microscopic and macroscopic features. The presence and nature of these mural nodules – benign versus malignant is of prime importance as their treatment and prognosis is poles apart.[3] Sarcoma like nodules representing a reactive phenomenon behave in a benign manner whereas carcinomatous or sarcomatous nodules have much worse prognosis. Their histogenesis is still debatable.

Two cases of sarcomatous nodules associated with ovarian mucinous neoplasm are being presented here.

**CASE REPORTS**

**Case 1**

A 66 year old female presented with complaints of abdominal pain and distension. A contrast enhanced computed tomography of the abdomen was done which revealed a multicystic lobulated lesion extending from the pelvis to the epigastrium measuring 40 cm × 30 cm × 12 cm with multiple thick and thin septations suggestive of large mucinous cystadenoma [Figure 1]. Her CA 125 was 118.4 IU/mL. Clinically, a diagnosis of mucinous cystadenoma was considered. Surgery was performed on gross examination the cyst was multiloculated with focal necrotic areas. At few places the wall showed multiple white to brown nodules [Figure 2a]. On histology, the cyst wall was lined by benign mucinous epithelium and subepithelialy showed highly pleomorphic spindled cells infiltrating the surrounding ovarian stroma [Figure 3a]. On IHC the overlying epithelium was positive for cytokeratin (CK) [Figure 4a] and the underlying spindle cells were positive for Vimentin [Figure 5a]. A diagnosis of mucinous cyst adenoma with sarcomatous nodules was established. The patient has currently received two cycles of carboplatin and paclitaxel regimen and is doing well.

**Case 2**

A 65 year old female presented with complaints of pain abdomen, abdominal distension, and nonpassage of stools for 4 days to the emergency room. She was taken up for an emergency laparotomy, and a large ovarian cyst was found. The cyst was removed and sent for histopathological examination. On gross examination, the cyst was multiloculated with focal necrotic areas. At few places, the wall showed multiple white to brown nodules [Figure 2a]. On histology, the cyst wall was lined by benign mucinous epithelium and subepithelialy showed highly pleomorphic spindled cells infiltrating the surrounding ovarian stroma [Figure 3a]. On IHC the overlying epithelium was positive for cytokeratin (CK) [Figure 4a] and the underlying spindle cells were positive for Vimentin [Figure 5a]. A diagnosis of mucinous cyst adenoma with sarcomatous nodules was established. The patient has currently received two cycles of carboplatin and paclitaxel regimen and is doing well.

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mass occupying the pelvic cavity pressing the bowel was seen. The mass was resected and received in the histopathology department. On gross examination, the mass was partly solid and cystic with gray white area [Figure 2b]. Histology of the lesion showed features of mucinous cystadenocarcinoma with pleomorphic sarcomatous nodule [Figure 3b]. The lining epithelium was immunoreactive for CK [Figure 4b] and the sarcomatous component for vimentin [Figure 5b] and negative for the epithelial markers. She was advised chemotherapy but refused and was lost to follow up.

**DISCUSSION**

In India, proportion of ovarian cancer varies from 6% to 7.7% of all female cancers.[4] Epithelial tumors account for 75% of all ovarian tumors.[5] Mucinous ovarian neoplasms represent 36% of all ovarian tumors, out of which 75% are benign, 10% atypical, and 15% are malignant, respectively.[6] These ovarian mucinous neoplasms are rarely associated with mural nodules.[7] The nodules can be anaplastic carcinomatous, sarcomatous, or sarcoma like. Microscopic features along with immunohistochemistry helps in proper characterization. The mural nodules are usually seen in females in postmenopausal age group, frequently the nodule is single but rarely can be multiple. Grossly, the nodule is white to brown in color with necrotic areas. Here, both women were postmenopausal and presented with abdominal pain and distention. The first case had multiple sarcomatous nodules whereas the second case had a single nodule in the wall of the ovary. On microscopy, both the cases showed highly pleomorphic spindled cells infiltrating the surrounding ovarian parenchyma. These cells were immunoreactive for vimentin and negative for CK. Infiltrating into the surrounding stroma ruled out the possibility of sarcoma like nodule. A positivity of vimentin and negativity of CK in the spindled cells excluded carcinomatous nature of the mural nodules and eventually diagnosis of sarcomatous nodule was established. The mucinous ovarian neoplasm associated with mural nodules can be benign, borderline, or malignant. In our cases, the first case was associated with a benign mucinous

**Figure 1:** Contrast enhanced computed tomography shows septate cystic lesion

**Figure 2:** (a) Multiloculated cystic structure with multiple solid white nodules in the cyst wall. (b) Solid cystic mass with single nodule in the wall with frank areas of necrosis

**Figure 3:** (a) Photomicrograph showing benign mucinous cuboidal to columnar unilayered epithelium, subepithelial pleomorphic spindled cells infiltrating into the surrounding ovarian stroma identified (case 1) (H and E, ×100). (b) Photomicrograph showing stratified mucinous epithelium exhibiting hyperchromasia, increased nucleocytoplasmic ratio, with pleomorphic spindled cells seen in the subepithelium (case 2) (H and E, ×400)

**Figure 4:** (a) Lining epithelium immunoreactive for cytokeratin (IHC, ×100). (b) Lining epithelium immunoreactive for cytokeratin (stroma is not reactive for cytokeratin) (IHC, ×400)

**Figure 5:** (a) Spindle shaped cells present in the subepithelium are immunoreactive for Vimentin (whereas the lining epithelial is nonreactive) (IHC, ×400) (b) Spindle shaped cells present in the subepithelium are immunoreactive for Vimentin (whereas the lining epithelial is nonreactive) (IHC, ×400)
neoplasm and the second case showed pleomorphism, atypia, stratification and invasion of the mucinous lining hence establishing a diagnosis of malignant mucinous neoplasm. Sarcoma like nodules probably represent a reactive process, whereas the sarcomatous or carcinomatous nodules arise as a result of divergent differentiation of a mucinous neoplasm or probably dedifferentiation.\[^6,7\]

The prognosis of patients with malignant mural nodules that is sarcomatous or carcinomatous type is usually poor. The mortality rate is up to 43% in 1.5 years,\[^7\] whereas the 5 year survival rate for patient with FIGO stage 1 invasive mucinous ovarian carcinoma is 91%\[^8\]

Thus, careful identification and classification of mural nodule is required as carcinomatous and sarcomatous nodules require adjuvant chemotherapy. The current cases highlight the importance of thorough sampling of tumor to identify the correct entity and hence provide the correct plan of action.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initial s will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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