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CASE REPORT

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Kruckenberg Tumour Secondary to Occult Colonic Mucinous Adenocarcinoma: A Diagnostic Challenge in A Young Female

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Abstract

This is a report of Mucinous Adenocarcinoma of the Colon with Synchronous Ovarian Metastasis – Kruckenberg tumour in a young female of low socioeconomic background with deceptive presentation emphasizing the diagnostic complexity and the need for clinical adaptability in resource-constrained settings. A 36-year-old woman (G2P2L2) presented with progressive abdominal pain and a rapidly enlarging mass in the right lumbar region. An ultrasonography was consistent with a high-risk ovarian malignancy (ORADS-5). Due to financial constraints, advanced imaging modalities and tumour marker evaluation were deferred. Staging laparotomy was conducted to evaluate possible malignancy and revealed tumour deposits involving not just the ovaries but the ileum, jejunum, mesentery, and omentum too. Cytoreductive surgery was performed. Histopathology demonstrated mucinous tumour cells with signet rings in the stroma of both the ovaries, and along with immunohistochemistry confirmed the diagnosis of "Primary Mucinous Adenocarcinoma of the Colon with Ovarian Metastasis– Kruckenberg Tumour". Postoperatively, the patient declined further treatment due to financial limitations.

Keywords: Krukenberg Tumor, Adenocarcinoma, Mucinous, Colorectal Neoplasms, Immunohistochemistry, SATB2 Protein, Human, Developing Countries

1 Background

Mucinous adenocarcinomas account for 10–20% of all colonic cancers and are associated with a poorer prognosis[1]. Only about 3.4% of these cases metastasize to the ovaries[2]. The average age at diagnosis is 51 years, though 24% of cases occur in patients under 40, disproportionately affecting younger women[3, 4].

Krukenberg tumors are defined as ovarian metastases of commonly gastrointestinal origin characterized by stromal infiltration of poorly differentiated adenocarcinoma and mucin secreting signet ring cells[5].

Colorectal carcinoma has become a growing contributor to Krukenberg tumors (1% to 2% of all ovarian neoplasms)[6]. These tumors often share overlapping clinical features with primary ovarian malignancies, such as pelvic mass, abdominal

pain, altered bowel habits, and bloating, all of which pose a significant diagnostic challenge. Therefore, accurate differentiation requires comprehensive pathological, radiological, and surgical evaluation[7].

2 Case Details

A 36-year-old woman (G2P2L2, all vaginal deliveries) presented to the hospital with a presumptive diagnosis of ovarian torsion. She reported mild lower abdominal pain of one month's duration, worsening over the preceding four days, with a one-month-old right lumbar mass enlarging in the past 15 days. Menstrual, personal and family history were non-significant.

On general examination, vitals were stable (BP: 110/70 mmHg, HR: 120 bpm), but marked pallor was noted. Abdominal examination revealed a firm, mobile, non-tender mass measuring approximately 12 × 12 cm in the hypogastric region. Mild hepatosplenomegaly was noted. Gynaecological examination was unremarkable. Notable laboratory findings were Haemoglobin: 5.8 g/dL & CA-125: 9.36 U/Ml.

Pelvic Ultrasonography revealed a large, hyperechoic solid mass in the right adnexa (129 × 84 mm) with internal vascularity, follicles in periphery and a congested pedicle containing multiple venous channels, suggestive of a high-risk ovarian malignancy consistent with ORADS-5 (Fig. 1). Due to financial constraints, no advanced imaging (CT/MRI) or colonoscopy was undertaken.

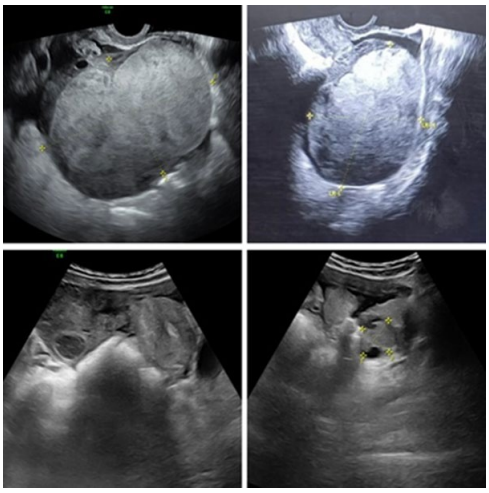

Fig. 1: Ultrasonography showing a large hyperechoic right adnexal mass consistent with ORADS- 5

2.1 Intra-Operative Findings

A diagnostic laparotomy was performed. 50 mL of serous peritoneal fluid was aspirated. Intraoperatively, the right ovary was enlarged (13 × 10 × 8 cm) and was replaced by a 10 × 10 cm cystic lesion. The left ovary was smaller (3 × 2.5 × 0.5 cm), with a 3 × 2 cm cystic lesion containing follicles, without surface deposits (Fig. 2**A-B**).

However extensive tumor like deposits were observed, including miliary-like deposits over the bladder peritoneum, bilateral pelvic peritoneum, right lumbar and subdiaphragmatic peritoneum, pouch of Douglas, jejunum, ileal serosa, mesentery, and omentum. The omentum was notably cocooned and densely adherent to the caecum, leading to luminal narrowing, suggesting possible infiltration and partial obstruction. Patient attenders were counselled about advanced state and the need for cytoreductive surgery.

The procedure included: Total Abdominal Hysterectomy (TAH), Bilateral Salpingo-Oophorectomy (BSO), Resection of Bladder and Parietal Peritoneum, Omentectomy, Segmental Ileocecal resection with side-to-end ileo-ascending anastomosis, aimed at preventing further caecal infiltration and complete obstruction. Adhesions were noted between the tumor mass and cecum, calling for a rent 4cm from the ileal end (Fig. 2**C-D**). The postoperative course was uneventful. The patient required transient inotropic support and was gradually weaned off by postoperative day 3. She was discharged in stable condition.

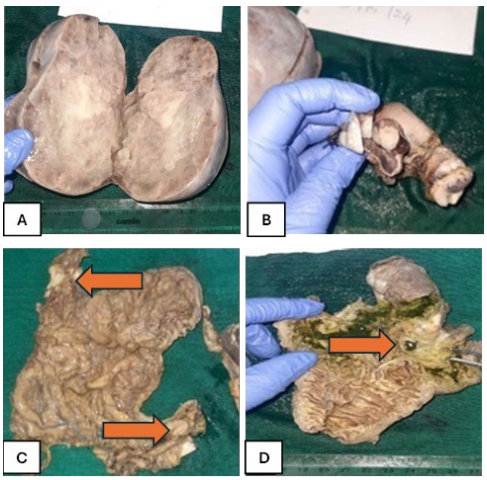

Fig. 2: Gross pathology findings: (HPE NO:3915/24). A) Cut section of enlarged right ovary showing organised mucoid tissue. B) Cut section of left ovary exhibiting a smaller solid-cystic lesion. C) Tumour deposits in omentum (orange arrows). D) tumour deposits insegment of resected intestine; ileum, caecum, partial ascending colon (orange arrow)

2.2 Gross-Pathology

The right ovary appeared enlarged with intact, smooth, and congested outer capsule. C/S revealed organised mucinous tissue interspersed with focal grey-white areas (Fig. 2**A**). The

left ovary exhibited a smaller solid-cystic lesion, with grey-white areas (Fig. 2**B**). Leading to suspicion about ovaries' possible metastatic nature. The specimen of resected intestine, two omental flaps and linear peritoneal flap appeared nodular with areas of congestion and multiple solid grey-white deposits. (Fig. 2**C-D**). A circumferential growth was noted at the caecal rent, measuring 4 × 2 cm, with a 2 cm-thickened caecal wall leading to luminal narrowing.

On cut section, the tumor appeared grey-white and extended from the mucosa to the serosa. The mucosa of the ileum and colon notably appeared unremarkable.

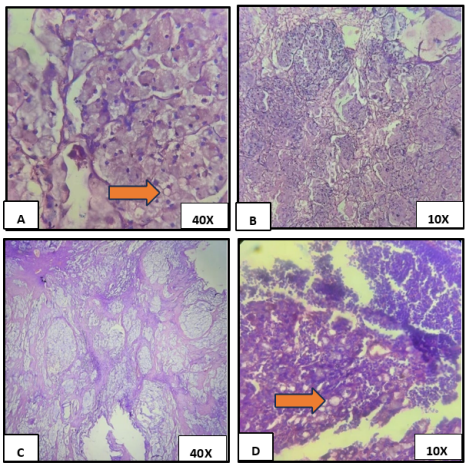

Fig. 3: Microscopic H&E Findings. A) Right ovarian tissue showing signet ring cells (orange arrow) with mucinous cytoplasm. B) Right ovarian tumour withglandular and nested tumour cell architecture. C) Metastatic invasion of omentum. D) Metastatic invasion of local lymph node along with signet ring cells (orange arrow)

2.3 Microscopic-Findings

Histologic sections of the both ovaries revealed total replacement of the ovarian stroma by metastatic tumor composed of polygonal cells with abundant mucin-rich cytoplasm and numerous signet ring cells (Fig. 3**A-B**). The colonic tissue demonstrated neoplastic glands infiltrating the submucosa, muscularis propria, serosa, and adjacent mesentery, arranged in sheets, nodules and nests. Consistent with the criteria for Krukenberg tumor. Metastatic deposits and similar histology were noted in the omentum, peritoneum, and peritoneal surfaces surrounding the uterus (Fig. 3**C**). Lymphovascular invasion was observed in one of the resected lymph nodes, with identifiable signet ring cells on H&E staining (Fig. 3**D**).

The histological features were consistent with a diagnosis of mucinous adenocarcinoma, grade G3 (poorly differentiated). Based on the AJCC 8th edition, the pathological staging was pT4a, N1a, M1c. IHC revealed CK20 positive and CK7 negative, confirming a primary colorectal origin of the malignancy. SATB2 & CDX2 were notably negative.

3 Discussion

This case describes a 36 year old woman (P2L2) who presented to the OPD with only complaints of mild abdominal pain and a gradually enlarging abdominal mass. Clinical findings which commonly demonstrate a less aggressive clinical course for Colorectal Carcinoma with Ovarian Metastasis compared to other reports in the literature.

Most previously documented cases have presented with more alarming symptoms such as progressive abdominal distension, vomiting, constipation, or weight loss, all of which are indicative of an advanced stage at the time of diagnosis[8, 9]. In contrast, our patient's vague symptoms contributed to a delay in clinical suspicion, highlighting the diagnostic challenge of metastatic ovarian tumors in younger women, where such tumors are infrequently anticipated.

The age of the patient further complicated early recognition, as Krukenberg tumors predominantly occur in postmenopausal women in their fourth to sixth decades of life[8, 9]. Although a proportion of cases are diagnosed in premenopausal women, involvement in those under 40 remains highly uncommon. Gastric malignancies are the most common source of Krukenberg Tumours and fewer than 0.5% of those occur in women under 30[10, 11]. Running contrary to this, a handful of studies note up to 60% of Kruckenberg tumours occur in premenopausal women. Thus, although awareness of these tumors is essential in all age groups when bilateral ovarian masses are encountered, the occurrence in younger women remains a distinct exception rather than the rule[12, 13]. Our patient represents this underreported and unusual categories, as she is 36 years old with no comorbidities, reinforcing the importance of clinical vigilance when bilateral adnexal masses are identified in younger women.

According to a variety of literature, krukenberg tumors typically appear as bilateral solid or solid–cystic ovarian masses, often with smooth external surfaces and minimal adhesions. It is important to note ascites is also commonly present, along with malignant cells and nonsepecific radiological features that mimic the presentation of primary ovarian malignancies. Leading to misdiagnosis, especially in mucinous types[11, 14]. Histologically, Krukenberg tumors are defined by mucin rich signet ring cells infiltrating a dense ovarian stroma, and immunohistochemical profiling is crucial for distinguishing metastatic from primary disease[15].

In our case, pelvic ultrasonography revealed a large (129 × 84 mm), hyperechoic, bilateral adnexal solid mass with internal vascularity and features consistent with ORADS 5 risk

classification. The right ovarian pedicle was noted to be congested with multiple venous channels, while the peripheral ovarian tissue showed multiple follicles.

With the presentation being relatively rare according to a study by Chen *et al.*[16], which reports prevalence as being cystic-solid (63.6%), purely cystic (27.3%), and purely solid (9.1%) in other cases. While most similar cases utilize CT scans for identifying both ovarian and gastrointestinal involvement. our imaging was limited to ultrasound due to resource constraints. This may have contributed to a delayed recognition of the metastatic nature of the disease. Although our initial scans did not show peritoneal involvement, intraoperative findings later confirmed their presence, this consistent with literature reports that up to 81.8% of colorectal ovarian metastases demonstrate peritoneal seeding and often lack lymphadenopathy[16].

Histologically, our case showed classic features of Krukenberg tumors. Sections from both ovaries revealed complete replacement of the stroma by metastatic tumor composed of polygonal cells with abundant mucin rich cytoplasm and numerous signet ring cells. Additionally, colonic tissue demonstrated neoplastic glands infiltrating the submucosa, muscularis propria, serosa, and adjacent mesentery, arranged in sheets, nodules, and nests, which are features consistent with a colorectal primary.

Cytoreductive surgery (CRS) is typically indicated in Krukenberg tumors when complete resection (R0) is feasible and disease is confined to the ovaries or pelvis[17, 18]. In colorectal cancer, CRS is particularly recommended when ovarian metastases are localized and systemic chemotherapy is less effective[19, 20]. Our patient, however, had confirmed spread to the omentum, peritoneal surfaces, and lymph nodes, which exceeds standard criteria. Nonetheless, CRS was pursued to address both the high tumor burden and a partial intestinal obstruction, both of which are complications not commonly reported in similar case reports. While achieving complete resection in the presence of peritoneal spread is challenging, it is associated with improved outcomes when possible[21]. This decision was followed an individualized and need based surgical management technique for a patient with limited access to further oncologic care.

Immunohistochemistry in our case supported a colorectal origin, showing CK20 positivity and CK7 negativity. However, both CDX2 and SATB2 were negative which is an uncommon finding and introduced diagnostic uncertainty when compared with the typical CK20+/CDX2+/SATB2+ profile seen in metastatic colorectal adenocarcinomas[22, 23]. Studies note CDX2 (a transcription factor associated with intestinal epithelial differentiation) may be lost in poorly differentiated, mucinous, or right sided tumors, and its absence has been linked with aggressive histology[24, 25].

Although one earlier study reported concordant expression of SATB2 and CDX2 in colorectal adenocarcinomas[26], subsequent research into Krukenberg tumors noted that CDX2 expression tends to persist while SATB2 expression is more variable[27]. This discrepancy may be attributed to CDX2 being a more sensitive marker for gastrointestinal differentiation, whereas SATB2 has higher specificity for lower gastrointestinal origin.

This dual negativity is shown to be rare and underscores the need for a multimodal diagnostic approach that incorporates morphologic evaluation, clinical correlation, and a wide panel of immunohistochemical markers. Beyond just diagnosis, the absence of CDX2 and SATB2 may carry prognostic significance. Colorectal cancers lacking these markers have been associated with aggressive biological behaviour, reduced disease specific survival, and a higher likelihood of lymph node involvement, especially among MMR deficient subtypes[28, 29]. These findings suggest that while CK20 and morphology may point toward a colorectal origin, reliance on a single immunoprofile is insufficient especially in atypical or poorly differentiated tumors.

4 Conclusion

In conclusion, our case represents a rare instance of Krukenberg tumor with primary mucinous adenocarcinoma of the colon metastasising to bilateral ovaries in a younger patient with minimal symptoms and no co-morbidities. The lack of advanced imaging and inconclusive IHC (CDX2 & SATB2 negative) underlines the importance of integrated surgical pathology and clinical suspicion in guiding diagnosis. As well as highlighting the need for accessible and affordable cancer care health programmes.

Compared to published cases, our approach stands out in terms of early patient age, broader surgical intervention, and presentation with minimal symptoms, contributing valuable insights to the spectrum of metastatic ovarian tumors.

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Author Contributions

Author 1 contributed primarily to the report write up with literature review and preparation of the draft. Author 2 and 3 provided essential understanding and help for formatting, analysis and final revisions. Author 4 assisted in drafting specific sections of the report and ensuring quality. Author 5 and 6 contributed to critical revisions of the manuscript and ensured accuracy in clinical interpretation. All authors have read and approved the final version of the manuscript, affirm it represents honest work and meet the criteria for authorship.

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