Clinical History:

The patient underwent haematopoietic stem cell transplantation for a T-cell lymphoma and a cyclophosphamide therapy was performed. The patient was in total remission of disease but developed haematuria and abdominal effusion. CT and follow-up US examinations were performed.

Imaging Findings:

Abdominal CT and US examinations revealed moderate bilateral hydronephrosis (Fig. 1) and large amount of abdominal effusion (Fig. 2). Targeted evaluation of urinary bladder showed bladder distension and the presence of intraluminal masses, likely referred to clots, with diffuse wall thickening of urinary bladder (Fig. 3); intraluminal gas resulted from placement of a Foley catheter (Fig. 3).

Discussion:

Haemorrhagic cystitis (HC) is a complication that might occur after high dose chemotherapy and irradiation. HC is a common complication in children and adults undergoing haematopoietic stem cell transplantation (HSCT) [1]. Diagnosis is based on detection of microscopic or macroscopic haematuria; patients may report dysuria, frequent or urgent voiding and lower abdominal pain. Aetiologic factors include the catabolism of chemotherapeutic agents, in particular oxazaphosphorine drugs (cyclophosphamide and ifosfamide) or busulfan, that may lead to an early onset of HC; in these cases cystitis may result from urothelial injury and viral infections, especially sustained by polyomaviruses, such as BK virus and JC virus. Adenoviruses may be responsible of a late-onset HC, occurring in the post-engraftment period (40-80 day following transplantation) and resulting from reactivation of latent infection; HC can also represent a manifestation of graft-versus-host disease (GVHD). Severe haematuria might require blood transfusions and in rare cases renal failure might occur as a consequence of important bleeding that cause clot formation and bladder tamponing [2].

Suspected HC requires US evaluation, allowing visualisation of bladder, kidneys and the first upper urinary tract. Three patterns of sonographic findings in haemorrhagic cystitis were described: type 1 with focal wall thickening, appearing as an hyperechoic mass protruding but not reducing bladder capacity; type2, in which wall thickening becomes diffuse; type 3, in which bladder capacity is reduced because of a patchy hypoechoic mass surrounded by a hyperechoic peripheral layer expanding into the bladder lumen. Computed Tomography and cystoscopy findings
reflect these patterns: cystoscopy shows mucosal oedema, parietal vascular telangiectasia with submucosal and superficial clots in type 1; these findings become more evident in type 2, while type 3 shows an important mucosal oedema, transmural haemorrhage and bulky intraluminal clots [3].

Treatment of haemorrhagic cystitis depends on its intensity: prevention of urinary obstruction, transfusional support and analgesic therapy are generally adopted in HC management, but a standard treatment algorithm has not been adopted yet [4].

**Differential Diagnosis List:** Haemorrhagic cystitis following haematopoietic stem cell transplantation, Haemorrhagic cystitis, Urinary infection

**Final Diagnosis:** Haemorrhagic cystitis following haematopoietic stem cell transplantation

**References:**


Figure 1

**Description:** US of upper abdomen, showing right kidney moderate hydronephrosis (arrows). **Origin:** Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini

**Description:** Coronal CT reconstruction image, showing bilateral hydronephrosis (arrows). **Origin:** Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini
**Figure 2**

**a**

*Description:* Abdominal CT image, showing abdominal effusion (asterisks). *Origin:* Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini

**b**

*Description:* Coronal CT reconstruction image, confirming abdominal effusion (asterisk). *Origin:* Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini
Description: Axial US image of lower abdomen, showing urinary bladder completely occupied by hypoechoic masses and hyperechoic material; wall thickening of urinary bladder can be observed too.

Origin: Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini
**Description:** Sagittal US image of lower abdomen, showing urinary bladder completely occupied by hypoechoic masses and hyperechoic material; Foley catheter balloon (asterisk) can be seen. **Origin:** Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini
Description: CT image of lower abdomen showing dense material occupying the urinary bladder (asterisk) and its wall thickening (white line); intraluminal gas results from placement of urinary catheter.

Origin: Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini

Description: Coronal CT reconstruction image, confirming clots occupying the urinary bladder (asterisk) and its wall thickening (white line). Origin: Università degli Studi di Genova - IRCSS AOU San Martino - IST, Dipartimento di Diagnostica per Immagini