Hemorrhagic radiation cystitis is an example of a typical radiotherapy-induced adverse event. However, the optimal treatment for hemorrhagic radiation cystitis is not known. There are limited data regarding the use of argon plasma coagulation for hemorrhagic radiation cystitis. Here, we present the use of argon plasma coagulation using a gastrointestinal endoscope to treat hemorrhagic radiation cystitis. The patient was a 75-year-old male patient with hemorrhagic radiation cystitis due to external beam irradiation for prostate adenocarcinoma. Six years after radiotherapy, the patient presented with macroscopic hematuria over the preceding 4 months, and laboratory investigations revealed a low hemoglobin level. The hematuria was not controlled with 2 days of bladder irrigation using normal saline. Thus, argon plasma coagulation using an upper gastrointestinal endoscope was considered for treatment of the hemorrhagic radiation cystitis. The cystoscopic examination revealed diffuse radiation cystitis with oozing telangiectasia and coagula. All of the bleeding sites and telangiectasia were coagulated using argon plasma coagulation. Following treatment, the patient’s clinical symptoms improved and did not recur. The hemoglobin level also recovered. No complications associated with the treatment were observed during the 6-month follow-up period. Thus, argon plasma coagulation using a gastrointestinal endoscope is a safe and effective treatment for hemorrhagic radiation cystitis.

Key words: radiation cystitis – argon plasma coagulation – endoscopic treatment – radiation toxicity
for HRC is unknown. Here, we present a case of HRC successfully treated with the novel application of endoscopic APC.

**CASE REPORT**

A 75-year-old male patient was treated with external beam irradiation (71 Gy) for 8 weeks for Gleason 10 (5 + 5) prostate adenocarcinoma (cT4, N0, M0, cStage4) in 2007. He had a history of HRP that had been successfully treated with endoscopic APC 11 months after the radiotherapy. His medication history included aspirin for a previous cerebral infarction.

Six years after radiotherapy, the patient presented to the emergency room at our hospital complaining of urinary frequency, dysuria, and hematuria that had progressed rapidly over the previous 4 months. Laboratory investigations resulted in a low serum hemoglobin level (9.3 mg/dl). Pelvic enhanced computed tomography showed diffuse thickness of the bladder wall with no evidence of local recurrent prostate cancer.

The aspirin was discontinued, and we performed bladder irrigation using normal saline for 2 days following hospitalization; however, the hematuria was not controlled. Thus, endoscopic APC was considered as a treatment option for HRC, similar to its therapeutic use for HRP. The procedure was reviewed and approved by the hospital’s institutional review board, and the patient provided informed consent prior to treatment.

We inserted a narrow-diameter (5.8 mm) upper gastrointestinal endoscope (GIF-XP290N; Olympus, Tokyo, Japan) in the urethra and advanced the endoscope into the bladder under sedation with midazolam. The fluid in the bladder was then emptied using routine endoscopy suction, after which the bladder was infused with the least amount of carbon dioxide necessary to enable the endoscopic view of the bladder wall. Care was taken not to overinflate the bladder to avoid an air embolism. No devices were used to measure intrabladder pressure. The cystoscopic examination revealed diffuse radiation cystitis; in particular, multiple oozing telangiectasia and coagula were observed on the posterior wall and trigone (Fig. 1A and B).

Then, a 2.3-mm diameter front firing flexible APC probe (APC probe 2200A; Erbe Elektromedizin, Tübingen, Germany) was passed through the accessory channel of the endoscope and extended ~1.0 cm from the top of the scope. This was connected to the argon gas source and an electrosurgical unit (APC2; Erbe Elektromedizin). The argon gas flow and electrical power were set at 0.6 l/min and 30 W, respectively. The APC probe was directed at the telangiectatic lesions and held near the mucosal surface avoiding direct contact. First, the area of active bleeding and oozing were coagulated (Fig. 2); the areas that were not bleeding or oozing but appeared as possible sources of bleeding were also coagulated. Following the APC treatment, the treated mucosa appeared as a pale, well-circumscribed ulcer with discrete margins (Fig. 3). The total procedure time was 30 min.

The patient was discharged from the hospital on the following day, without evidence of macroscopic hematuria. Aspirin was administered again on the following day after discharge. The serum hemoglobin level also recovered (11.4 mg/dl) 3 months later. The patient’s urinary symptoms of hematuria and dysuria improved and did not recur over the 6-month observation period. Only mild frequent urination remained, but the symptom did not worsen. No adverse events occurred during the observation period.

**DISCUSSION**

Various interventions have been used historically to treat HRC, including simple bladder irrigation, cystoscopic...
fulguration, intravesical treatment with alum or formalin, hydrodistention, hyperbaric oxygenation, internal iliac embolization and cystectomy (5,6). However, there is a paucity of data regarding the effectiveness of these treatments for HRC. Thus, the optimal treatment for HRC has still not been determined (4).

APC involves the delivery of unipolar diathermy current in a non-contact fashion using the inert gas argon as the conducting medium; it is promising primarily owing to its superficial effect, with a coagulation depth of only 2–3 mm (7–9). APC has been shown to be a safe, highly effective and long-lasting therapy in patients with mild-to-moderate rectal HRP (10), and APC treatment of HRP results in success rates of 80–100% with long-term adverse events in up to only 5% of patients (11,12). As a result, APC is increasingly recommended as the first-line treatment for HRP (13).

In contrast, there is limited evidence for the use of APC via a gastrointestinal endoscope for the treatment of HRC. Owing to our experience with APC for HRP, we considered it as a therapy in the current patient with HRC; as a result, the APC was a successful and effective treatment for HRC in this patient. While bladder irrigation treatment did not resolve his long-standing hematuria, the APC treatment did. Furthermore, the patient did not experience any symptoms of bladder irritation or require further intervention during the follow-up period.

To the best of our knowledge, only one report exists of seven cases with HRC treated by APC with a power setting of 40–60 W and gas flow rate of 1.5 l/min (14). Six cases were completely treated after one session, while one case required re-treatment (mean follow-up, 15 months) with no significant adverse events for any of the patients. Therefore, APC has been reported as one of the endoscopic laser coagulation treatments such as neodymium:yttrium-aluminum-garnet (Nd:YAG), potassium titanyl phosphate, and 980 nm diode lasers with success rates of 93–100% (15). Specifically, Nd:YAG is a typical laser coagulation treatment that coagulates only a restricted area to considerable depths of 4–6 mm (16,17). Large tissue necrosis is commonly seen with the use of Nd:YAG treatment, which can result in long-lasting irritation caused by the sloughing off of necrotic tissue (18). Because APC can coagulate relatively superficial layers and wider areas than other laser coagulation methods, APC could be a more effective and safe treatment for HRC.

Another advantage of APC via a gastrointestinal endoscope is the availability and routine use of argon gas delivery electrosurgical units and gastrointestinal endoscopes in most hospitals with an established gastrointestinal endoscopy unit. Thus, the establishment costs for this treatment are low. However, other laser coagulation treatment systems are not available in most hospitals.

There is no consensus regarding the optimal APC settings (power and gas flow rate) for successful and safe coagulation in HRP, with reported power settings and argon flow rates ranging from 25 to 80 W and 0.6 to 2 l/min, respectively (13,19). However, it has been reported that low-power settings are better for safe and effective outcomes using APC (20); we have also successfully used low-power APC settings (30 W) with an argon flow rate of 0.6 l/min for HRP treatment. These same settings were also successfully used in the present HRC case, without any adverse events.

A gastrointestinal endoscope is able to approach from any direction owing to its freely flexible point, and is also able to perform suction and infusion. In this case, the use of the APC probe and a narrow-diameter endoscope (5.8 mm) allowed us
to access the bladder through the urethra; in addition, the accessory channel enabled us to perform suction and carbon dioxide infusion in the bladder.

Despite the benefits of APC treatment for HRP, and potentially HRC, it is not appropriate in severe HRP with mucosal ulcerations, because it may result in perforation and/or intractable enlarged ulcerations. Therefore, we also suggest that APC may not be appropriate in cases of severe HRC with mucosal ulcerations.

Conventional treatments for HRC are often not successful. Our experience suggests that APC can effectively and safely be used in the treatment of HRC. Further assessment and comparison of this modality to other currently available treatments is needed. In the meantime, we suggest that patients with HRC should be treated with endoscopic APC before using more radical approaches, such as cystectomy or urinary diversion.

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Conflict of interest statement
None declared.

References