Successful treatment of idiopathic retroperitoneal fibrosis with combined immunosuppressive therapy

Uspešno lečenje idiopatske retroperitonealne fibroze kombinovanom imunosupresivnom terapijom

Katarina Obrenčević*, Dejan Petrović†, Predrag Aleksić‡, Marijana Petrović§‖, Nemanja Rančić§¶, Dragan Jovanović§¶, Bojan Nikolić**, Mirjana Mijušković§‖, Neven Vavić*§||, Ljiljana Ignjatović||, Djoko Maksić§||

Military Medical Academy, *Solid Organ Transplantation Center, †Clinic for Nephrology, **Institute of Radiology, ‡Clinic for Urology, ¶Centre for Clinical Pharmacology, Belgrade, Serbia; University of Defence, §Faculty of Medicine of the Military Medical Academy, Belgrade, Serbia; University of Kragujevac, Faculty of Medical Sciences, ‖Department of Internal Medicine, Kragujevac, Serbia

Abstract

Background/Aim. Idiopathic retroperitoneal fibrosis (IRF) is characterized by the fibroinflammatory periaortic tissue that affects the ureters, causing obstructive nephropathy and variable impairment of renal function. The findings strongly suggest an autoimmune etiology. The optimal treatment has not been established. The aim of this study was to analyze a long-term efficacy of combined corticosteroid therapy with mycophenolate mofetil (MMF) in the patients with IRF.

Methods. We retrospectively followed 13 patients (8 males and 5 females) with IRF. All patients received corticosteroids and MMF. For the patients with severe renal failure, an initial ureteral decompression was made and prednisone was started orally 0.5 mg/kg with fast tapering. In cases with a mild renal failure corticosteroids were administrated as intravenous methylprednisolone pulses for 3 days, followed by oral prednisone. The dose of MMF was 1000 mg twice a day. MMF was stopped after 18 months and prednisone after 48 months.

Results. Systemic symptoms resolved in all patients. Erythrocyte sedimentation (SE) rate declined from the mean of 67.6 to 26.3 mm/h and C-reactive protein (CRP) from the mean of 18.5 to 6.3 mg/L. In 7 out of 8 patients, the ureteral stents were successfully removed 13 weeks on average. Seven patients had 100% of reduction in the periaortic mass, and the average percent reduction was 76.9%. The kidney function improved and remained normal in 6 treated patients. In 4 patients a mild chronic renal failure remained due to function of one kidney. Three patients, with a prior chronic renal failure, did not get worse renal function. The disease recurred in 3 patients. There were no treatment side effects noted.

Conclusion. Combination of corticosteroids and MMF is a potentially effective treatment in restoring the renal function and reducing the fibrotic tissue in the patients with idiopathic retroperitoneal fibrosis. It could prevent the need for ureteral stenting and surgery. Longer treatment may reduce a possibility of recurrence.

Key words: retroperitoneal fibrosis; renal insufficiency; autoimmune diseases; adrenal cortex hormones; mycophenolic acid; remission induction; recurrence.

Apstrakt

Uvod/Cilj. Idiopatska retroperitonealna fibroza (IRF) karakteriše se periaortnim fibroinflamatornim tkivom koje zahvata uretere dovodeći do opstruktivne nefropatije i različitog stepena bubrežne insuficijencije. Oboljenje je najverovatnije autoimune etiologije. Optimalna terapija do sada nije definisana. Cilj rada bio je analiza dugoročne efikasnosti kombinovane imunosupresivne terapije kortikosteroidima i mikofenolat mofetilom u lečenju IRF. Metode. Retrospektivno je proučeno 13 bolesnika (8 muškaraca i 5 žena) sa IRF.

Svi bolesnici su primili kortikosteroide i mikofenolat mofetil (MMF). Kod bolesnika sa izraženom bubrežnom insuficijencijom, prvo je učinjena dekompresija urinarnog trakta i potom započeta terapija peroralnim prednisonom 0,5 mg/kg sa brzim smanjivanjem doze. Bolesnici sa umerenom bubrežnom slabosću primili su inicijalno tri pulsepse mehtilprednisolona intravenski, a potom je nastavljeno sa prednisonom. Doza MMF je bila 1000 mg dva puta dnevno. MMF je obustavljen nakon 18 meseci, a prednison nakon 48 meseci. Rezultati. Kod svih bolesnika došlo je do povlačenja opših simptoma bolesti. Vrednost sedimentacije eri...
trochita (SE) smanjena je sa prosečnih 67,6 na 26,3 mm/h, a C-reactivnog proteinca (CRP) sa prosečnih 18,5 na 6,3 mg/L. Kod sedam od ukupno osam bolesnika, ureteralni stentovi su uspešno izvedeni nakon prosečno 13 nedelja. Sedam bolesnika imalo je 100% redukciju periaortnog tkiva, a prosečni stepen redukcije je bio 76,9%. Bubrežna funkcija je poboljšana, kod šest bolesnika je normalizovana, dok je kod četiri zaostala umeren hronična bubrežna slabost usled afunkcije jednog bubrega. Tri bolesnika sa prethodnom hroničnom bubrežnom infizicijom nisu pogoršala funkciju. Recidiv bolesti imala su tri bolesnika. Nisu registrovani neželjeni efekti terapije. 

Zaključak. Kombinovana pri-

ences in treatment are mainly based on the observations of case reports, or small groups of patients. So far, the optimal IS agent, the dose and the length of the treatment have not been established 1.

The aim of this retrospective study was to analyze a long-term efficacy of combined steroid therapy with myco-

phenolate mofetil (MMF) in the patients with IRF.

Methods

Patient population

From January 2004 to May 2016, 13 patients were re-

ferred to the Nephrology Clinic for management of IRF. All patients underwent the CT or MRI, intravenous urography and ultrasound examination (US).

The patients were asked about past or current use of me-

thylsgeride, β blockers, ergotamine, methyldopa, or a history of recent infections, abdominal trauma, pelvic or abdominal sur-

gery and external beam radiation. They, all underwent the ap-

propriate cancer screening, according to the gender and age. The IRF diagnose was based on characteristic clinical and CT find-

ings. Two patients had prior histological confirmation from the biopsy material taken during ureterolysis.

The baseline laboratory screening included the erythro-
cyte sedimentation rate (ESR), C-reactive protein (CRP), complete blood count, chemistry profile with creatinine, anti-

thyroid peroxidase antibodies (anti-TPO antibodies), thy-

roglobulin antibodies, thyroid stimulating hormone (TSH), testing for antinuclear antibodies (ANA), antineutrophil cy-
toplasmic antibodies (ANCA) and rheumatoid factor (RF).

Treatment

All patients received steroids with MMF. The patients with severe acute renal failure received a double-J ureteral stent (DIS) or percutaneous nephrostomy (PNS). After that, steroids were started as oral prednisone 0.5 mg/kg/day for one month, then tapered to maintenance of 10–5 mg/day. In the patients with a mild renal failure with no placement of DIS/PNS, steroids were given as an intravenous methylpred-
nisolone pulses: 250 mg/day each for three consecutive days, followed by oral prednisone 0.5 mg/kg/day for one month, with tapering the dose as mention above. MMF was adminis-
tered orally in a dose of 1000 mg twice daily for the first 6
months, then reduced to 500–750 mg twice daily, as the maintenance dose, till the end of 18 months. Steroids were stopped after 48 months from the start of the therapy.

Follow-up

All patients were followed monthly in the first 6 months, then every 3 months till the end of the second year. After that, the patients were seen once in 4–6 months. At each control, the patients were submitted to the clinical examination, US examination and to the following laboratory tests: ESR, CRP, serum creatinine level, complete blood count and urine analysis.

Normal range for ESR according to gender was: 0–25 mm/h in males, 0–30 in the females, and for CRP 0–5 mg/L.

The CT scan, or MRI of abdomen was performed at 6, 12, 24 and 48 months after the initiation of the therapy. After that, the CT scan, or MRI was performed in the case of suspected recurrence of disease.

A decision to remove the ureteral stents, or PNS was made in collaboration with an urologist. It was based on the improvement in laboratory parameters and radiographic evidence that the fibrotic mass no longer encased the affected ureter.

Active disease was defined by the presence of a periaortic mass surrounding one of both ureters with hydronephrosis at CT/MRI associated with an increase in CRP and/or ESR.

Remission of the disease was defined by a regression of hydronephrosis and by a reduction of the fibrotic tissue at CT/MRI in comparison with the basal examination together with the normalization of CRP and/or ESR.

Recurrence of the disease was defined by the CT/MRI-proven increase of the periaortic mass with, or without entrapment of one, or both ureters associated with a new increase in CRP and/or ESR.

Radiographic review

The abdominal cross sectional imaging either by the contrast enhanced CT, or MRI was reviewed by a single radiologist. The patients were classified based on the extent of the soft-tissue mass verified on the first visit using a classification previously described by Scheel and Feeley [12]: class I: the soft-tissue density surrounding the infrarenal aorta and/or iliac vessels; class II: the soft-tissue density surrounding the infrarenal vena cava; class III: the lateral extension of inflammation/fibrosis with compression of one or both ureters; class IV: the extension of fibrosis to include the renal hilum with the compression of the renal artery and/or renal vein.

The patients could be categorized in multiple classes based on the extent of disease seen on imaging. The temporal change in the disease was determined by measuring the thickness of soft tissue relative to the aorta on the CT scan, or MRI.

Statistical analysis

The complete statistical analysis of data was done using the statistical software package, PASW Statistics 18® [SPSS (Hong Kong) Ltd., Hong Kong]. All variables were presented as frequency of certain categories. The $\chi^2$ test was used for analysing the significance of differences of categorical variables. The continuous variables were presented as means and standard deviations, or median with a range and were compared using the Mann-Whitney $U$ test, or the Kruskal-Wallis test. The distribution normality was tested by using the Shapiro-Wilk test (number of subjects was less than 50). All analyses were estimated at $p < 0.05$ level of the statistical significance.

The principles of International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) Good Clinical Practice guidelines were strictly followed. Ethical approval from the Ethics Committee of the Military Medical Academy was obtained for the study protocol on January 21st, 2016.

Results

Of the 13 patients, there were 8 males and 5 females (Table 1). The mean age at the time of diagnosis was $54.0 \pm 6.9$ years (range 36–60 years). The patients were followed for a mean period of $99.1 \pm 34.6$ months (median 99.4, range 41.6–150.1 months).

| Patient characteristics | Values |
|-------------------------|--------|
| Age (year), mean ± SD (range) | $54 \pm 6.9$ (36–60) |
| Male, number (%) | 8 (61.5) |
| Female, number (%) | 5 (38.5) |
| First presentation/recurrence, number | 10/3 |
| Symptoms on presentation, cumulative number (%) |
| weight loss | 11 (84.6) |
| back pain | 8 (61.5) |
| fatigue | 7 (53.8) |
| nausea | 4 (30.8) |
| leg edema | 4 (30.8) |
| abdominal pain | 3 (23.1) |
| new onset of hypertension | 2 (15.4) |
| both (abdominal, back) pain | 1 (7.7) |
| hydrocele | 1 (7.7) |

SD – standard deviation.
Table 2

| Parameters                  | Baseline mean ± SD | Follow-up mean ± SD | p value* |
|-----------------------------|--------------------|---------------------|----------|
| ESR (mm/hr)                 | 67.6 ± 33.8        | 26.3 ± 30.2         | < 0.001  |
| CRP (mg/L)                  | 18.5 ± 10.4        | 6.3 ± 5.2           | < 0.001  |
| WBC (>10³/L)                | 8.3 ± 1.7          | 8.6 ± 1.6           | < 0.001  |
| Hgb (g/L)                   | 113.7 ± 18.1       | 141.1 ± 17.2        | < 0.001  |
| Serum creatinine (µmol/L)   | 334.5 ± 326.3      | 124.5 ± 69          | 0.010    |
| GFR (mL/min)                | 33.3 ± 21.6        | 59.2 ± 20.8         | 0.014    |

ESR – erythrocyte sedimentation rate; CRP – C-reactive protein; WBC – white blood cells; Hgb – hemoglobin; GFR – glomerular filtration rate; SD – standard deviation; * – Kruskal Wallis test.

The most frequent symptoms at the time of diagnosis were the weight loss, back pain, fatigue, nausea, leg edema, abdominal pain, new onset of hypertension and simultaneously abdominal and back pain (Table 1). The other symptoms were hydrocele, headache, appetite loss and weakness. The duration of symptoms before diagnosis ranged from 3–15 months.

Only 2 of 13 patients had an identified risk factor for RF (use of β blockers). Ten patients had a history of prior comorbidities: hypertension in 10, diabetes mellitus in 3 and hypothyroidism in two patients.

At presentation, 12 of 13 patients had ureteral obstruction which was bilateral in 11 of them. In 8 out of 12 patients with hydronephrosis, the ureteral obstruction was relieved by a placement of the DJS in 7 and PNS in one patient. These procedures were done in other hospital in 7 of these patients.

As a complication of this procedure, 6 patients (75%) had a urinary tract infection which was resolved by using the appropriate antibiotics.

Figure 1 shows the radiographic classification of the patient population at presentation. All patients had active disease. Twelve patients had renal dysfunction with a mean serum creatinine of 334 µmol/L (range was from 108–1022 µmol/L). Out of these, 9 patients presented as the acute renal failure which was oligoanuric in 5 (38.5%). One was treated with hemodialysis before the admission to our hospital. Initially, three patients already had chronic renal failure. They were admitted for recurrent disease, after the previous treatment with surgical and/or IS therapy.

Table 2 shows the initial and follow-up laboratory data. ESR and CRP were elevated in 11 patients (range 26–140 mm/hr and 5.8–31 mg/L respectively). The mean hemoglobin level was 114 g/L (range 78–140 g/L).

Two patients with hypothyroidism had positive anti-TPO antibodies. Other autoantibodies were negative in all patients.

The remission occurred in all patients 12.7 ± 15.9 weeks (median 4 weeks) on average. The relief of pain and systemic symptoms was achieved in average 4 weeks.

The obstruction relief was observed after 4 weeks in 8 patients (61.5%), after 6 months in 10 (77%), and at the end of follow-up in 12 patients (92%). In 7 patients DJS and PNS were successfully removed, on average, 13 weeks after insertion (range from 3 to 32 weeks). In one patient, previously treated by ureterolysis, bilateral DJS were replaced by bilateral PNS due to the persistent obstruction, and was successfully removed after one year from one side. The other side required continued decompression due to the focal ureteral stricture for the total of 4 years. After that period, he stopped coming for the control examination and he was lost from the follow-up.

The ESR values declined from a mean 67.6 mm/hr to 26.3 mm/hr and the CRP values declined from the mean of 18.5 mg/L to 6.3 mg/L (Table 2, Figure 2).
The kidney function improved with increasing the GFR from the mean of 33.3 to 59.2 mL/min (Figure 3). In 4 patients, the chronic renal failure remained with GFR lower than 60 mL/min due to a function of one kidney and in 3 patients with the chronic renal failure before treatment the renal function did not get worse.

Fig. 3 – The serum creatinine, glomerular filtration rate and hemoglobin values during the 4-year follow-up.

All patients had a reduction of the fibrotic tissue on the MSCT/MR imaging. Seven patients had 100% of reduction in the periaortic mass, and the average percentage reduction was 76.9%. Figure 4 shows a representative baseline and follow-up MSCT scan of this study population.

The recurrence of disease was observed in 3 patients (23%). Two of them stopped the therapy after 6 and 31 months, respectively. The recurrence of the disease occurred 18 and 4 months after cessation, respectively. They were retreated, and one fully responded to the therapy while the second did not, and he received ureterolysis. In the third patient, the recurrence occurred after completing the protocol at the end of 48th month; she was retreated with complete remission.

There were no serious side effects of the treatment. Three patients with the previous diagnose of diabetes mellitus did not require change of the current therapy: 2 stayed on oral hypoglycaemic, and the third one was already on insulin therapy without a significant worsening of glycaemia.

Discussion

We retrospectively examined the medical outcome of 13 patients with IRF, receiving combined immunosuppressive therapy with corticosteroids and MMF.

The demographics of our patient population were similar to those of other reported series. Males were affected more often (61%) with diagnose made mostly in the fifth decade of life 14. The most frequent constitutional symptom was the weight loss in 84.6% of the patients. The less frequent were the fatigue, nausea, appetite loss and weakness. The total of 92% of patients reported pain (back, abdominal, or both), which is consistent with other reports 8, 9, 14, 15.

Fig. 4 – The reduction of the fibrotic tissue (Class I, II and III retroperitoneal fibrosis): A) before treatment; B) after 6 months and C) after 48 months of treatment.

The etiology of IRF is not known, but several factors such as medications (β blockers, hydralazine, methysergide, ergotamine), surgery, radiation, infections and exposure to asbestos have been described as predisposing factors for developing retroperitoneal fibrosis, despite a scarcity of data to establish clear causal relationship 1. In our study, two patients had a prior use of β blockers. This association was however described in the limited case reports in the relevant literature 16, 17. Having in mind that the large number of patients take β blockers worldwide, we agree with some authors observation that this connection seems unlikely 14, 15, 18–20.
Additionally, one patient from our series decided to restart with β blockers after entering remission, and he did not experience recurrence of the disease for 74 months of follow-up.

Some studies reported frequent association of IRF with other autoimmune diseases (Hashimoto’s thyroiditis, Graves’ disease, ANCA-associated vasculitis, membranous nephropathy, rheumatoid arthritis, systemic lupus erythematosus, psoriasis), or autoantibody positivity which emphasizes the autoimmune mechanisms in the pathogenesis of the disease. ANA were the most frequent antibodies, detected in 60% of patients with IRF without evidence of connective tissue disease. In our group, we observed two patients with Hashimoto’s thyroiditis and positive anti-TPO antibodies. This is consistent with the previous observations that autoimmune thyroiditis is the most frequent autoimmune disease associated with IRF. Other autoantibodies (ANA, ANCA, RF) were negative in all patients.

Idiopathic retroperitoneal fibrosis is a progressive disease for which the consistent therapeutic recommendations have not been devised. Encasement of the ureters by retroperitoneal fibrous tissue leads to the obstructive nephropathy and serious complication including the end stage renal failure. Because of the insidious clinical course and absent signs of impaired renal function until the late stage of the disease, about 75% of the patients had a renal failure and an irreversible shrinking of at least one kidney when diagnosis was made.

The treatment goals are to relieve ureteral obstruction, to stop the fibroinflammatory reaction and to prevent the recurrence of the disease.

Nowadays, a surgical treatment alone (ureterolysis with intraperitonealization and omental wrapping of the ureters) is not considered the first–line approach because of the high recurrence rate of the ureteral obstruction in up to 50% of patients. Also, the surgical treatment has no effect on the irreversible shrinking of at least one kidney when diagnosis was made.

The treatment goals are to relieve ureteral obstruction, to stop the fibroinflammatory reaction and to prevent the recurrence of the disease.

Nowadays, a surgical treatment alone (ureterolysis with intraperitonealization and omental wrapping of the ureters) is not considered the first–line approach because of the high recurrence rate of the ureteral obstruction in up to 50% of patients. Also, the surgical treatment has no effect on the irreversible shrinking of at least one kidney when diagnosis was made. The treatment goals are to relieve ureteral obstruction, to stop the fibroinflammatory reaction and to prevent the recurrence of the disease.

Nowadays, a surgical treatment alone (ureterolysis with intraperitonealization and omental wrapping of the ureters) is not considered the first–line approach because of the high recurrence rate of the ureteral obstruction in up to 50% of patients. Also, the surgical treatment has no effect on the irreversible shrinking of at least one kidney when diagnosis was made. The treatment goals are to relieve ureteral obstruction, to stop the fibroinflammatory reaction and to prevent the recurrence of the disease.

Nowadays, a surgical treatment alone (ureterolysis with intraperitonealization and omental wrapping of the ureters) is not considered the first–line approach because of the high recurrence rate of the ureteral obstruction in up to 50% of patients. Also, the surgical treatment has no effect on the irreversible shrinking of at least one kidney when diagnosis was made. The treatment goals are to relieve ureteral obstruction, to stop the fibroinflammatory reaction and to prevent the recurrence of the disease.

Nowadays, a surgical treatment alone (ureterolysis with intraperitonealization and omental wrapping of the ureters) is not considered the first–line approach because of the high recurrence rate of the ureteral obstruction in up to 50% of patients. Also, the surgical treatment has no effect on the irreversible shrinking of at least one kidney when diagnosis was made. The treatment goals are to relieve ureteral obstruction, to stop the fibroinflammatory reaction and to prevent the recurrence of the disease.
apy. Pelkmans et al. 47 found that the long-term decrease in ESR and CRP correlated with CT–documented mass regression. Like Scheel and Feeley 14, we observed a positive correlation of ESR as well as CRP with the disease activity.

All patients had reduction of the fibrotic tissue on MSCT/MRI, with the average 76.9% of reduction. Six patients did not achieve 100% of the mass reduction. The complete regression of the fibrotic tissue after therapy is very infrequent and a thin layer persists even in the patients who maintain complete remission. This residual mass, probably in most cases, represents metabolically inactive tissue 48.

Additionally, the kidney function improved and remained normal in 6 treated patients. In 4 patients the mild chronic renal failure remained due to afnction of one kidney. In 3 patients, with prior chronic renal failure, the renal function did not get worse. They all were previously treated for IRF with different strategies: by the first strategy – only with ureterolysis, disease was reoccurred after 4 months, by the second strategy – with ureterolysis and the IS agents (azathioprine and tamoxifen), the relapse occurred 33 months after cessation of IS therapy, and by the third one – with ureteral stenting for 12 months. None of the patients died during the follow-up.

The recurrence rate in our study was 23% (3 patients). Two patients did not finish the protocol and stopped the therapy after 6 months and 31 months, respectively. Third patient has completed the protocol and the recurrence occurred at the end of 48th month. This could indicate a need for longer duration of the treatment.

We did not observe the serious side effects of the treatment. In 3 patients with prior diagnose of diabetes mellitus the glycaemia did not worsen, and MMF was well tolerated without gastrointestinal, hematologic, or other abnormalities.

In this study, we used a radiographic classification system based on the anatomic location of the disease proposed by Scheel and Feeley 14 which we found useful in making a correct diagnose and standardizing the extent of disease. Also, different classes could have different clinical outcomes, or complications. By definition, all patients should have class I disease. In our series, the majority of patients, 7 of them, had class I + II + III, 4 patients had class I + III, and 2 patients had I + III + IV class. The class IV usually had the lowest frequency, but these patients should be carefully monitored for the renal artery stenosis and had the endovascular stent placed, as it was required in one of our patients.

Study limitation

Our study, like many others, is limited by a small number of patients; the optimal management of IRF needs to be determined by prospective clinical trials in large patient cohorts.

Conclusion

Combined corticosteroid and the MMF therapy appears to be effective in restoring the renal function and reducing the fibrotic tissue in this small number of patients with IRF. It could prevent the need for the ureteral stenting and surgery. Longer treatment may reduce the possibility of recurrence. The long-term follow up is strongly recommended to estimate this regimen of treatment.

REFERENCES

1. Vaglio A, Salvatorini G, Baglio C. Retroperitoneal fibrosis. Lancet 2006; 367(9506): 241–51.
2. van Bommel EF, Jansen I, Hendriksz TR, Aarnoudse AL. Idiopathic Retroperitoneal Fibrosis: prospective evaluation of incidence and clinicoradiologic presentation. Medicine (Baltimore) 2009; 88(4): 193–201.
3. Miller OF, Smith LJ, Ferrara EX, McAleer IM, Kaplan GW. Idiopathic retroperitoneal fibrosis: a prospective study. Am J Med 2003; 114(6): 454–62.
4. Parum DV, Brown DL, Mitchell MF. Serum antibodies to oxidized low-density lipoprotein and ceroid in the chronic periarteritis. Arch Pathol Lab Med 1990; 114(4): 383–7.
5. Vaglio A, Corradi D, Manenti L, Ferretti S, Garini G, Baglio C. Evidance of autoimmunity in chronic periarteritis: a prospective study. Am J Med 2003; 114(6): 454–62.
6. Fujimori N, Ito T, Igarashi H, Oono T, Nakamura T, Niina Y, et al. Retroperitoneal fibrosis associated with immunoglobulin G4-related disease. World J Gastroenterol 2013; 19(1): 35.
7. Russi GM, Rasco R, Aecerri Battini E, Marriini C, Vaglio A. Idiopathic retroperitoneal fibrosis and its overlap with IgG4-related disease. Intern Emerg Med 2017; 12(3): 287–99.
8. Jogi S, Al-Jasser A, Temmam L. Idiopathic retroperitoneal fibrosis - a potential pitfall for fine needle aspiration cytology. Cytopathology 2005; 16(1): 49–50.
9. Wartnez K, Keskkin AG, Uhl M, Schütz G, Kastnerwald A, Vaitl P, et al. Immunosuppressive treatment of chronic periarteritis: a retrospective study of 20 patients with chronic periarteritis and a review of the literature. Ann Rheum Dis 2005; 64(6): 828–33.
10. Adler S, Lodermeier S, Gaa J, Hoemans U. Successful mycophenolate mofetil therapy in nine patients with idiopathic retroperitoneal fibrosis. Rheumatology (Oxford) 2008; 47(10): 1535–8.
11. Scheel PJ Jr, Suarez SM, Feeley N. Medical management of retroperitoneal fibrosis. Trans Am Clin Climatol Assoc 2012; 123: 283–90; discussion 290–1.
12. Binder M, Uhl M, Wetch T, Kolbert F, Thiel J, Saso JO, et al. Cyclophosphamide is a highly effective and safe induction therapy in chronic periarteritis: a long-term follow-up of 35 patients with chronic periarteritis. Ann Rheum Dis 2011; 71(2): 311–2.
13. Yan Y, Zhou B, Lan T, Wang X, Li C, Zhou H. Retroperitoneal Fibrosis: A Retrospective Clinical Data Analysis of 30 Patients in a 10-year Period. Chin Med J (Engl) 2015; 128(6): 804–10.
14. Scheel PJ, Feeley N. Retroperitoneal Fibrosis: the clinical, laboratory and radiographic presentation. Medicine 2009; 88(4): 202–7.
15. Kermani TA, Crowson CS, Adenbach SJ, Lathwa HS. Idiopathic Retroperitoneal Fibrosis: A Retrospective Review of Clinical Presentation, Treatment, and Outcomes. Mayo Clin Proc 2011; 86(4): 297–303.
16. Badmire DIF. Retroperitoneal fibrosis associated with atenolol. Br Med J 1980; 281(6232): 59–60.
17. Thompson J, Julian DG. Retroperitoneal fibrosis associated with metoprolol. Br Med J 1982; 284(6309): 83–4.
Transpl 2015; 26(4): 816–22.

Retroperitoneal fibrosis: A retrospective review of clinical and secondary forms of retroperitoneal fibrosis: A diagnostic approach. Rev Méd Interm 2015; 36(1): 15–21.

Cereoni G, Urban ML, Coronadi D, Lauratini F, Marino M, Uberti E, et al. Association between idiopathic retroperitoneal fibrosis and autoimmune thyroiditis: A case–control study. Autoimmun Rev 2015; 14(9): 1303–5.

Vaglio A, Palmisano A, Ferretti S, Albertis F, Casazza I, Sabarani C, et al. Peripheral inflammatory arthritis in patients with chronic periarthritis: report of five cases and review of the literature. Rheumatology 2007; 47(3): 315–8.

Demko TM, Diamond JR, Griff J. Obstructive nephropathy as a result of retroperitoneal fibrosis: a review of its pathogenesis and associations. J Am Soc Nephrol 1997; 8(4): 684–8.

Vanakaran G, Palmisano A, Afidra A, Bezzaid F, Versari A, Miniola G. Retroperitoneal fibrosis associated with psoriasis: a case series. Scand J Rheum 2009; 38(1): 68–9.

Moroni G, Gallielli B, Banfi G, Sandri S, Masa P, Ponticelli C. Long-term outcome of idiopathic retroperitoneal fibrosis treated with surgical and/or medical approaches. Nephrol Dial Transplant 2006; 21(9): 2485–90.

Vaglio A, Martiati F. Idiopathic Retroperitoneal Fibrosis. J Am Soc Nephrol 2016; 27(7): 1880–9.

Kardar AH, Kattan S, Lindstedt E, Hanash K. Steroids in the Treatment of Retroperitoneal Fibrosis. Transplantation 2006; 21(9): 2485–90.

Pelkmans LG, Aarnoudse AL, Hendriksz TR, van Bommel EF. Mycophenolate mofetil for maintenance of remission in idiopathic retroperitoneal fibrosis. Rheumatology 2006; 46(4): 717–8.

Khalil F, Mir MA, Venuto RC. Mycophenolate mofetil in the treatment of retroperitoneal fibrosis. Clin Rheumatol 2008; 27(5): 679–81.

Yavuz RD, Lake AM, Roberts WF, Faerber GJ, Wolf JS Jr. Idiopathic retroperitoneal fibrosis: a role for mycophenolate mofetil and corticosteroids. Lancet 1998; 352(9135): 1195.

Swartz RD, Lake AM, Roberts WF, Faerber GJ, Wolf JS Jr. Idiopathic retroperitoneal fibrosis: A Retrospective Analysis of 60 Cases. Br J Urol 2002; 168(6): 550–5.

Baker LR, Mallinson WJ, Gregory MC, Menzies EA, Cattell WR, Urban ML, Palmisano A, Afeltra A, Buzzulini F, Versari A, Miniola G. Retroperitoneal Fibrosis. Rheum Dis Clin North Am 2013; 39(2): 365–81.

Obrenović K, et al. Vojnosanit Pregl 2019; 76(10): 1014–1021.