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*Case report*

## Radial Artery Aneurysm Following Coronarography in Hemodialysis Patient: A Challenging Complication of Catheterization

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### Abstract

Percutaneous radial arterial cannulation is routinely used in cardiac surgery and in hemodynamic monitoring in intensive care units. As for coronarography, it is now considered superior to femoral artery access as it has lesser vascular complications. Nevertheless, this procedure can have many consequences, though aneurysm is an exceptional one. Its occurrence is highly correlated with multiple risk factors such as advanced age, longer duration of catheterization, hospitalization duration, and infection with *Staphylococcus aureus*. We report an uncommon case of radial artery aneurysm following coronarography in hemodialysis patient for which he underwent successful surgery.

**Keywords:** radial artery, aneurysm, coronarography, hemodialysis, catheterization

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### Introduction

The transradial approach to vascular access in interven-

tional cardiology is now commonly used in different parts of the world [1]. It reduces vascular complications and improves patient comfort. However, it is not without side effects. Its main complications may include hematoma at the puncture site (10%), arterial thrombosis (20 to 38%) and infection at the puncture site (0.4-4%) [2] Arteriovenous fistula, dissection or aneurysm are exceptional complications, but may lead to dramatic consequences. [3,5] We report a case of a right radial artery aneurysm following coronary angiography in a patient on chronic hemodialysis.

### Case report

An 80-year-old patient with type 2 diabetes with end-stage chronic renal failure receiving hemodialysis treatment for the duration of one year. She had a left radial fistula. The patient presented at the emergency department with acute coronary syndrome. Coronary angiography was performed using the right radial approach. A compression bandage was systematically put in place for 12 hours. On the tenth day, we observed a minimal pulsatile mass and an ulcerative lesion at the



**Fig. 1.** Pre-operative view of the radial aneurysm, pulsatile mass of 2,5 cm.

puncture site of the radial artery. Local and systemic antistaphylococcal antibiotics were administered to the patient. Ultrasonography was performed and showed an aneurysm 8 mm in diameter (radial artery was 3 mm in diameter). No intra-aneurysmal thrombus was observed. The distal artery was patent with good Doppler flow quality. As no more complications were present, therapeutic abstinence with a close clinical follow-up was recommended. The mass grew slowly over time, and two months following coronarography, physical examination revealed a soft pulsating mass of 6 cm in diameter with no sign of ischemia (Figure 1). Doppler ultrasound showed no interruption in the radial artery flow. The aneurysm was partially thrombosed; however, the deep and superficial palmar arches were patent. Based on aneurysm size and the high risk of embolization, the medical team and the patient elected to undergo surgical treatment. The aneurysm was exposed and then resected. Intraoperatively, an intra-aneurysm thrombus was observed. On direct examination and in culture, no germs were detected on the aneurysmal shell, the thrombus nor the radial artery. One month after the intervention, the patient presented no complications.

## Discussion

The radial artery approach to vascular access is increasingly preferred to the femoral one in coronary angiography [6]. The complications of this catheterization are not uncommon, though they are often benign. Ischemic are rare [6,7]. Arteriovenous fistulas and arterial dissections are exceptional accidents. The post-catheterization radial aneurysm is very rare as well (0.05% of radial catheterizations) and is frequently associated with vascular site infection with staphylococcus aureus, whether it is local or general [4]. Other predisposing factors include age and multiple puncture attempts [4]. In our case report, two factors were noted: a general vascular pathology [8], and a local staphylococcus aureus infection [4]. The latter is a highlighted factor in a significant study: nine of the ten aneurysms reported in the series presented with staphylococcal sepsis. [4] If the infection is evident on direct examination or culture in the majority of cases, they may be no laboratory evidence in many others: samples, either endoluminal material or aneurysmal shell were negative in four out of nine general infections for the series of Falk and al [4]., as well as in our case. Consequently, the aseptic nature of the thrombus or blister is likely not to rule out an infectious etiology, most regularly caused by Staphylococcus aureus. Despite their rarity, post-catheterization aneurysms may have dramatic complications, which may comprise ischemic embolus, rupture, and even gangrene. On account of these life-threatening consequences, these aneurysms must be acknowledged and treated, ideally by resection, or at least by exclusion. In the ca-

se of our patient, the aneurysm was resected with no postoperative complications. This case report rises an important issue regarding radial catheterization in hemodialysis patients, whose vascular capital is utterly valuable. Albeit its superiority to the femoral access in

coronarography, the radial artery approach in hemodialysis patient must be assessed thoroughly, as it may, if complicated, compromise potential confection of arteriovenous fistulas for vascular access. For instance, if our patient, who already suffers from severe diabetic angiopathy, presented with malfunction of her left radial fistula, with insufficiency of the vascular capital in the left upper limb, creating an arteriovenous fistula using the right radial artery would be very challenging following the multiple interventions it underwent.

## Conclusion

Radial artery aneurysm is a rare post-catheterization complication [8]. It is often linked to Staphylococcus infection and advanced age. However, despite its superiority to the femoral artery in terms of general vascular complications, its use in hemodialysis patients should be questioned as it may compromise the creation of potential arteriovenous fistulas whenever necessary.

*Conflict of interest statement.* None declared.

## References

1. Brzezinski M, Luisetti T, London MJ. Radial artery cannulation: a comprehensive review of recent anatomic and physiologic investigations. *Anesth Analg* 2009; 109(6): 1763-1781.
2. Gabriel B, Marek K. Radial Artery Mycotic Aneurysm. *Eur J Vasc Endovasc Surg* 2019 ; 58(6): 838.
3. Swanson E, Freiberg A, Salter DR. Radial artery infections and aneurysms after catheterization. *J Hand Surg Am* 1990; 15: 166-171.
4. Falk PS, Scuderi PE, Sherertz RJ, Motsinger SM. Infected radial artery pseudoaneurysms occurring after percutaneous cannulation. *Chest* 1992; 101: 490-495.
5. Cohen A, Reyes R, Kirk M, Fulks RM. Osler's nodes, pseudoaneurysm formation, and sepsis complicating percutaneous radial artery cannulation. *Crit Care Med* 1984; 12: 1078-1079.
6. Hudelo C, Maillard L, Quilliet L, et al. Comparaison de la coronarographie realisee par l'artere radiale gauche versus artere femorale droite avec un catheter de 4 French. *Arch Mal Coeur Vaiss* 2000; 93: 813-819.
7. Gardner RM, Schwartz R, Wong HC, Burke JP. Percutaneous indwelling radial-artery catheters for monitoring cardiovascular function. Prospective study of the risk of thrombosis and infection. *N Engl J Med* 1974; 290: 1227-1231.
8. Mc Ellistrem RF, O'Toole DP, Keane P. Post-cannulation radial artery aneurysm: a rare complication. *Can J Anaesth* 1990; 37: 907-909.

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*Case report*

## Urinalysis May Solve the Diagnostic Dilemma in Vasculitis with Pulmonary Involvement Mimicking Tuberculosis

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### Abstract

**Introduction.** Tuberculosis is an endemic disease in developing countries and more prevalent than vasculitis. Patients with vasculitis may be intermingled due to similar findings at the time of presentation. Herein, we presented three cases of vasculitis emerging with rapidly progressive glomerulonephritis referred from the department of pulmonary diseases of another hospital within the same month.

**Cases.** All of the patients presented had constitutional symptoms. Two of them were in the second month of antituberculosis treatment while the other had only non-specific antibiotherapy. Two patients had no urine analysis during the period spent in the department of pulmonary diseases. All were referred to our hospital due to the need for hemodialysis at that time proteinuria and hematuria were detected in urine analysis of the three patients. With the proper diagnostic and therapeutic approach, two of the patients became free of dialysis, and pulmonary symptoms and signs recovered in all three.

**Conclusion.** Vasculitis with lung involvement should be in the list of differential diagnoses of the cases with clinical and radiological findings of tuberculosis without microbiological evidence. Therefore, the addition of urinalysis to the tuberculosis guidelines may be suggested solving this diagnostic problem.

**Keywords:** tuberculosis, vasculitis, lung, urine examination

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### Introduction

Pulmonary tuberculosis and vasculitis with pulmonary involvement may be intermingled due to similar findings at the time of presentation. As tuberculosis is more prevalent than vasculitis in some countries, patients with vasculitis may be missed. Herein, we presented three cases of vasculitis emerging with rapidly progressive glomerulonephritis referred from the depart-

ment of pulmonary diseases of another hospital within the same month.

**Case-1.** 56 years old male admitted to the department of pulmonary diseases due to fatigue, lack of appetite, and weight loss two months ago. He had bronchoscopic examination after finding bilateral diffuse micronodular opacities resembling miliary tuberculosis on chest X-ray and computed tomography (CT). Acid-fast bacilli were not detected in bronchoalveolar lavage fluid. As the pathological examination of the transbronchial biopsy revealed granulomatous lesions, he was started antituberculosis treatment. He gained weight with improved appetite and fatigue within the first month of treatment. But the presenting symptoms reappeared in the following weeks. Meanwhile, the culture of the bronchoalveolar lavage and sputum ended with no sign of tuberculosis. There was no elevation in serum transaminase levels during follow up. He was referred to our clinic due to elevated serum urea (260 mg/dl) and creatinine (16.5 mg/dl) levels detected during evaluation for severe fatigue, nausea, and vomiting. Hemodialysis treatment through a jugular catheter was started together with etiological evaluation. The chest X-ray was normal. The transbronchial biopsy specimen revision revealed neither granuloma nor findings consistent with vasculitis. Urine analysis showed proteinuria and the urine sediment revealed many erythrocytes per high power field. Cytoplasmic anti-neutrophil cytoplasmic antibody (c-ANCA) was negative while perinuclear anti-neutrophil antibody (p-ANCA) and anti-glomerular basement membrane antibody (Anti-GBM) were positive. Renal biopsy revealed fibrocellular crescents in six and cellular crescents in six of the 15 glomeruli detected in the biopsy sample. Immune fluorescence examination showed diffuse IgG staining on the glomerular basement membrane which was a diagnostic finding for anti-glomerular basement membrane disease. He was treated with pulse methylprednisolone intravenously followed by oral treatment, pulse intravenous cyclophos-

phamide, and 15 sessions of plasmapheresis. On follow-up examinations, p-ANCA and anti-GBM turned negative but renal functions did not improve and the patient remained hemodialysis dependent.

**Case-2.** 55-year-old male was referred to the department of pulmonary diseases due to diffuse interstitial pattern on chest CT performed due to symptoms of fatigue, weakness, and weight loss. In the patient's history, he has been on antituberculosis treatment for six months in 2005. After the direct examination of sputum that resulted negative for acid-fast bacilli, he had a bronchoscopic examination which did not reveal any sign of consistent with malignancy or tuberculosis. The patient was referred to our clinic after the realization of increasing serum creatinine levels from 1.7 mg/dl to 4.7 mg/dl during hospitalization. He had four sessions of hemodialysis due to uremic symptoms and clinically overt hypervolemia. Urine analysis revealed proteinuria and microscopic hematuria. p-ANCA was found positive while c-ANCA was negative. A kidney biopsy could not be performed due to the lack of compliance of the patient. He was thought to have microscopic polyangiitis (MPA) with the clinical findings. Intravenous pulse corticosteroid and cyclophosphamide treatments were started concomitant with 10 sessions of plasmapheresis. After the onset of immunosuppressive treatment, the need for hemodialysis disappeared with the serum creatinine level decreasing to about 1.5 mg/dl.

**Case-3.** A 41 years-old woman was hospitalized in the department of pulmonary diseases two months ago due to the symptoms of coughing, bloody sputum, and fatigue. A cavitary lesion of 1.5 cm on the lower lobe of the left lung, and an area of infiltration involving cavitary lesion on the upper lobe of the left lung were detected on chest CT. Acid-fast bacilli were not detected on the direct examination of the sputum and bronchoalveolar lavage. Antituberculosis treatment was initiated due to granulomatous lesions found in the examination of the transbronchial biopsy specimen. She was referred to the department of nephrology due to increased intensity of hemoptysis which turned massive and elevated serum levels of urea (148mg/dl) and creatinine (5.9 mg/dl). Urine analysis revealed mild proteinuria and microscopic hematuria. c-ANCA was found positive. Erythrocyte transfusion was needed due to deep anemia resulting from massive hemoptysis. With the clinical diagnosis of granulomatosis with polyangiitis (GPA), she was given pulsed methylprednisolone and cyclophosphamide together with 12 sessions of plasma exchange using fresh frozen plasma. Hemoptysis disappeared following the institution of plasmapheresis. A renal biopsy was performed after the patient has been stabilized clinically. There were 13 fibrous-fibrocellular crescents among the 21 glomeruli present in the biopsy sample. Global collapse and sclerosis were observed in nine of

the glomeruli besides focal tubular atrophy and hyalinization and hyperplasia of the arterioles. Renal functions recovered following treatment with creatinine level decreasing to 1.4 mg/dl.

## Discussion

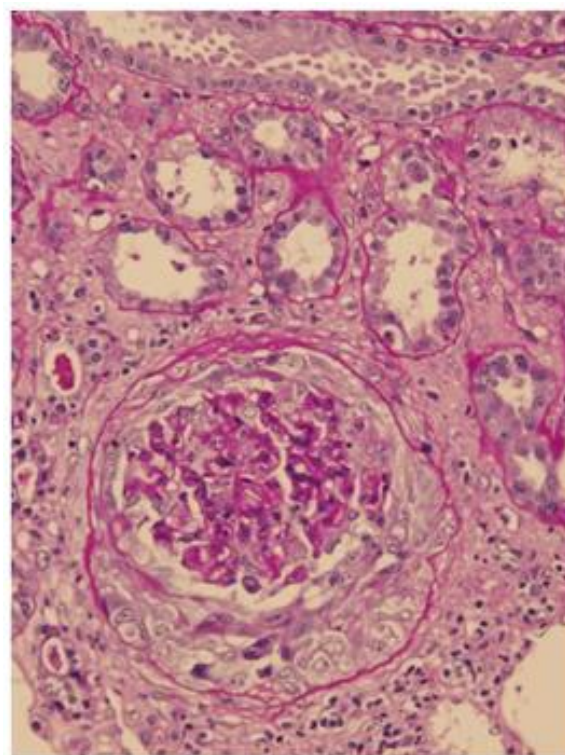
Pauci-immune glomerulonephritides, namely GPA, MPA, and Churg-Strauss syndrome (CSS), are most frequent in the fifth to seventh decade of life although they can be seen at any age. They are more frequent in males. Constitutional symptoms like fatigue, anorexia, sweating, and weight loss are common to almost all patients [1]. Goodpasture's disease is characterized by an acute presentation with hemoptysis in the absence of systemic findings except for anemia. Constitutional symptoms are more common in the presence of ANCA positivity together with Goodpasture disease as in the first case presented [2]. Hemoptysis is an ordinary finding besides these symptoms. Patchy infiltrations, nodular and cavitary lesions may be detected radiologically in GPA and CSS due to necrotizing granulomatous inflammation. Diffuse alveolar pattern, consolidation, ground-glass appearance, and increased bronchovascular images are more common radiological findings in MPA and Goodpasture's disease characterized by pulmonary capillaritis [1,3,4]. Diagnosis of patients with ANCA-associated glomerulonephritides may be confused with tuberculosis due to these common constitutional symptoms, hemoptysis and similar radiological findings. In countries with high prevalence of tuberculosis, these findings may be interpreted as tuberculosis usually. The lower identification rate of acid-fast bacilli on direct examination and culture methods, as 60% and 33.5%, respectively in cases of pulmonary tuberculosis may be another contributing factor for this approach [5]. All our patients presented had constitutional symptoms (Table 1). Two of them were in the second month of antituberculosis treatment while the other had only nonspecific antibiotherapy. They had no urine analysis before starting antituberculosis treatment. All were referred to our hospital due to the need for hemodialysis and at that time proteinuria and hematuria were detected in urine analysis of the three patients. With the proper diagnostic and therapeutic approach, two of the patients became free of dialysis, and pulmonary symptoms and signs recovered in all three. World Health Organization reported in the Global Tuberculosis Report 2017 that tuberculosis incidence in Turkey in 2016 was 18 per 100.000 population [6]. The prevalence of tuberculosis in Turkey seems to decrease. According to the report of the Turkish Ministry of Health in the 2018, the incidence of tuberculosis decreased from 29,4 per 100.000 population in 2005 to 15,3 per 100.000 in 2016 [6]. Although the prevalence of vasculitides in Turkey is not known, the prevalence rates for MPA, GPA, and CSS in Europe have been

**Table.** Summary of the clinical and laboratory characteristic findings of the patients

Age/Gender	CASE-1 56/male	CASE-2 55/male	CASE-3 41/female
Symptoms	Fatigue, lack of appetite, weight loss	Fatigue, weight loss	Lack of appetite, massive hemoptysis
Laboratory findings	Urea: 260 mg/dl, Creatinine: 16 mg/dl Urine analysis: Protein (++) erythrocyte (+++)	Urea: 90 mg/dl, Creatinine: 4,6 mg/dl Urine analysis: Protein (+), erythrocyte (++)	Urea: 148 mg/dl, Creatinine: 5,9 mg/dl Urine analysis: Protein (+), erythrocyte (+++)
Chest CT	Bilateral diffuse micronodular images resembling miliary involvement	Bilateral interstitial infiltrates on lung parenchyma	Cavitary lesion on the lower lobe, infiltration involving cavitary area on the upper lobe of the left lung
Serology	pANCA: (+) cANCA: (-) Anti-GBM: (+)	pANCA: (+) cANCA: (-) Anti-GBM: (-)	pANCA: (-) cANCA: (+) Anti-GBM: (-)
Treatment	Pulse methylprednisolone and cyclophosphamide, 15 sessions of therapeutic plasma exchange	Pulse methylprednisolone and cyclophosphamide, 10 sessions of therapeutic plasma exchange	Pulse methylprednisolone and cyclophosphamide, 12 sessions of therapeutic plasma exchange
Dialysis	Remained hemodialysis dependent	Four sessions	Three sessions
Last laboratory findings	On hemodialysis program	Urea: 66mg/dl, Creatinine: 1,4mg/dl Urine analysis: Protein (-), erythrocyte (-)	Urea: 72mg/dl, Creatinine: 1,4mg/dl Urine analysis: Protein (-), erythrocyte (-)

reported to be 2.5/100.000, 2.5/100.000 and 1/100.000, respectively [1]. The sum of these values makes 6/100.000 and this is not so far from the incidence rate of tuberculosis (15/100.000). Besides, Goodpasture disease with an incidence of 1/1.000.000 should not be forgotten [2]. So, vasculitic syndromes should always be in the list of differential diagnoses considering above mentioned clinical and radiological findings.

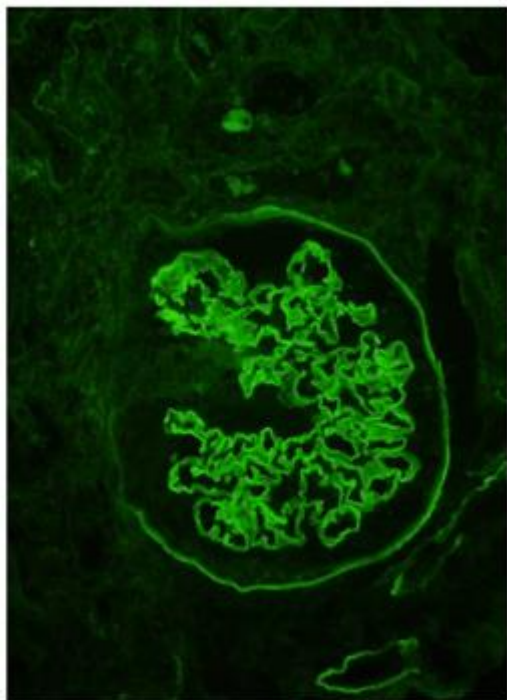
In cases of clinical and radiological findings without microbiological evidence of tuberculosis, the finding of active urine sediment and decreased renal functions should be alarming to the physician. Every patient without a definite diagnosis of tuberculosis may have renal function tests at least including urine analysis before anti-tuberculosis treatment in countries those endemic for tuberculosis. Urine analysis is a cheap and common diagnostic method all over the world. Guideline of the diagnosis and treatment of tuberculosis reported by the Turkish Ministry of Health in 2019 and treatment of tuberculosis guideline of The American Thoracic Society, Centers for Disease Control and Prevention, and Infectious Diseases Society of America jointly in 2016 recommended routine control of transaminase and creatinine levels, but not urine analysis [7,8]. Similarly, WHO and European Tuberculosis Guideline also did not mention any suggestions on the topic [9-11]. Besides the overlap between clinical and radiological findings at the time of presentation, it should be kept in mind that rifampicin and isoniazid may trigger vasculitis. Hence renal function tests and urine analysis should be performed at both onsets of therapy and also in case of any deterioration in the clinical status of the patient.



**Fig. 1a.** Cellular crescent formation in Bowman space, collapse of the glomerular tuft and karyorrhexis (HE 100x)

Even in case of need for hemodialysis at the time of diagnosis, with combined treatment (corticosteroids, cyclophosphamide and therapeutic plasma exchange) renal functions may recover as in two of the cases presented. But the improvement in renal functions is not





**Fig. 1b.** Diffuse linear staining of the glomerular capillary basal membrane and Bowman capsule with immune fluorescence staining (Anti-IgG FITC 100x)

expected in patients with Goodpasture disease who need hemodialysis at presentation. Although there are some studies reporting better prognosis for Goodpasture syndrome together with ANCA positivity compared to patients with only anti-GBM positivity, there are contrasting studies also [12]. The presented case with both pANCA and anti-GBM positivity needed hemodialysis at the time of admission to the nephrology clinic. Although pathological findings were better compared to the third case, renal functions did not recover with treatment protocol involving corticosteroids, cyclophosphamide, and therapeutic plasma exchange.

## Conclusion

In conclusion, pauci-immune glomerulonephritides and Goodpasture disease should be in the list of possible diagnoses in cases with clinical and radiological findings of tuberculosis without microbiological evidence. Hence, we suggest the addition of urine analysis to the tuberculosis guidelines may help to solve this diagnostic dilemma.

*Conflict of interest statement.* None declared.

## References

- Jennette JC, Falk RJ. Small-vessel vasculitis. *N Engl J Med* 1997; 337(21): 1512-1523. doi: 10.1056/NEJM199711203372106. PMID: 9366584.
- Charles D Pusey, Marten Segelmark. Editors: Glassock JR, Fervenza FC. Pathogenesis and diagnosis of anti-GBM antibody (Goodpasture's) disease. Last updated: Aug 10, 2020 UpToDate, Inc. (Retrieved 29.10.2020 from [https://www.uptodate.com/contents/anti-gbm-goodpasture-disease-pathogenesis-clinical-manifestations-and-diagnosis?search=goodpasture&source=search\\_result&selectedTitle=1~92&usage\\_type=default&display\\_rank=1#H2022123984](https://www.uptodate.com/contents/anti-gbm-goodpasture-disease-pathogenesis-clinical-manifestations-and-diagnosis?search=goodpasture&source=search_result&selectedTitle=1~92&usage_type=default&display_rank=1#H2022123984)).
- Collins CE, Quismorio FP Jr. Pulmonary involvement in microscopic polyangiitis. *Curr Opin Pulm Med* 2005; 11(5): 447-451.
- Man Pyo Chung, Chin A Yi, Ho Yun Lee, *et al.* Imaging of Pulmonary Vasculitis. *Radiology*. 2010; 255(2):322-341.
- Türk Tabipleri Birliği Tuberkuloz Raporu, TTB Tuberkuloz Çalışma Grubu, Ankara Türk Tabipleri Birliği Yayınları. Ocak 2012; 32-34.
- Türkiye'de Verem Savaşı 2018 Raporu, T.C. Sağlık Bakanlığı Verem Savası Dairesi Başkanlığı, Ankara, 2018: 39. ([https://toraks.org.tr/site/sf/nmf/pre\\_migration/a151814f7641ea4f8bca1efbce7cec8b15db2d4396308e1d8ac5a7289509494e.pdf](https://toraks.org.tr/site/sf/nmf/pre_migration/a151814f7641ea4f8bca1efbce7cec8b15db2d4396308e1d8ac5a7289509494e.pdf)) (Accessed: 29.10.2020).
- Tuberkuloz Tani ve Tedavi Rehberi, TC Sağlık Bakanlığı, Ankara, 2019. ([https://hsgm.saglik.gov.tr/depo/birimler/tuberkuloz\\_db/haberler/Tuberkuloz\\_Tani\\_Ve\\_Tedavi\\_Rehberi/\\_Tuberkuloz\\_Tani\\_ve\\_Tedavi\\_Rehberi.pdf](https://hsgm.saglik.gov.tr/depo/birimler/tuberkuloz_db/haberler/Tuberkuloz_Tani_Ve_Tedavi_Rehberi/_Tuberkuloz_Tani_ve_Tedavi_Rehberi.pdf)) (Accessed: 29.10.2020).
- Nahid P, Dorman SE, Alipanah N, *et al.* Executive Summary: Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible Tuberculosis. *Clin Infect Dis* 2016; 63(7): 853-867. doi: 10.1093/cid/ciw566. PMID: 27621353; PMCID: PMC6366011.
- Improving the diagnosis and treatment of smear-negative pulmonary and extrapulmonary tuberculosis among adults and adolescents, Recommendations for HIV-prevalent and resource-constrained settings, Stop TB department and Department of HIV/AIDS, World Health Organization, 2007.
- Treatment of tuberculosis: guidelines. World Health Organization, - 4th edition, 2010.
- Migliori GB, Zellweger JP, Abubakar I, *et al.* European union standards for tuberculosis care. *Eur Respir J* 2012; 39(4): 807-819.
- Kashif W, Yaqub S, Mahmood SF, Patel J. Double-positive Goodpasture's syndrome with concomitant active pulmonary tuberculosis. *Saudi J Kidney Dis Transpl* 2013; 24(4): 787.