

Clinical Outcomes of Antegrade Double-J Stent Placement in Patients with Failed Retrograde Ureteral Stenting

Retrograd Üreteral Stentlemenin Başarısız Olduğu Hastalarda Antegrad Double-J Stent Uygulamasının Klinik Sonuçları

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ABSTRACT

Objective: This study aimed to evaluate the technical and clinical success, complication profile, and clinical effectiveness of antegrade double-J (DJ) stent placement in patients in whom retrograde ureteral stenting had failed.

Materials and Methods: This retrospective study included patients who underwent antegrade DJ stent placement between 2021 and 2025 due to unsuccessful retrograde access. All procedures were performed under ultrasonographic and fluoroscopic guidance. Patients were categorized into single-stage and 2-stage antegrade stenting groups based on their clinical condition. All interventions were performed by a single experienced interventional radiologist. Technical and clinical success rates were assessed, and procedure-related complications were classified according to the Society of Interventional Radiology (SIR) guidelines.

Results: A total of 40 patients were included in the study; 45.0% were treated for benign and 55.0% for malignant ureteral obstruction. Antegrade double-J stent placement was technically successful in all patients, with a significant reduction in the degree of hydronephrosis observed after the procedure. Clinical evaluation demonstrated a statistically significant decrease in serum creatinine levels and visual analog scale (VAS) pain scores at 24 hours post-procedure ($p < 0.001$). No clinically significant decrease in hemoglobin levels was observed. The overall complication rate was 7.5%, and all complications were minor and resolved with conservative management.

Conclusion: Antegrade DJ stenting represents a safe, effective, and minimally invasive alternative in patients with failed retrograde access. When performed within a multidisciplinary framework involving urology and interventional radiology, this approach improves patient comfort and reduces the need for long-term percutaneous nephrostomy.

Keywords: ureteral obstruction, stents, percutaneous nephrostomy, urinary diversion, interventional radiology

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ÖZET

Amaç: Bu çalışmanın amacı, retrograd üreteral stent yerleştirmenin başarısız olduğu hastalarda antegrad double-J (DJ) stent uygulamasının teknik ve klinik başarısını, komplikasyon profilini ve klinik etkinliğini değerlendirmektir.

Gereç ve Yöntemler: Bu retrospektif çalışmaya, 2021–2025 yılları arasında retrograd girişimin başarısız olması nedeniyle antegrad DJ stent uygulanan hastalar dahil edildi. Tüm işlemler ultrasonografi ve floroskopi rehberliğinde gerçekleştirildi. Hastalar klinik durumlarına göre tek aşamalı ve çift aşamalı antegrad stentleme gruplarına ayrıldı. Tüm işlemler tek bir girişimsel radyoloji uzmanı tarafından gerçekleştirildi. Teknik ve klinik başarı oranları değerlendirildi. İşleme bağlı komplikasyonlar Society of Interventional Radiology (SIR) sınıflamasına göre kategorize edildi.

Bulgular: Toplam 40 hastanın dahil edildiği çalışmada olguların %45,0'ı benign, %55,0'ı malign nedenlere bağlı üreteral obstrüksiyon nedeniyle tedavi edildi. Antegrad double-J stent yerleştirilmesi tüm hastalarda teknik olarak başarılı olup, işlem sonrası hidronefroz derecelerinde anlamlı gerileme saptandı. Klinik değerlendirmede, serum kreatinin düzeyleri ve VAS ağrı skorlarında işlem sonrası 24. saatte istatistiksel olarak anlamlı düşüş izlendi ($p < 0,001$). Hemoglobin düzeylerinde klinik olarak anlamlı bir kayıp izlenmedi. Komplikasyon oranı %7,5 hesaplandı ve yalnızca minör düzeyde olup konservatif tedavi ile düzeldi.

Sonuçlar: Antegrad DJ stentleme, retrograd girişimin başarısız olduğu olgularda güvenli, etkili ve minimal invaziv bir alternatif olarak öne çıkmaktadır. Üroloji ve girişimsel radyoloji disiplinlerinin multidisipliner yaklaşımı ile uygulandığında hasta konforunu artırmakta ve uzun süreli perkütan nefrostomi gereksinimini azaltmaktadır.

Anahtar Kelimeler: üreteral obstrüksiyon, stent, perkütan nefrostomi, üriner diversiyon, girişimsel radyoloji:

INTRODUCTION

Ureteral obstruction is a clinically significant condition that may arise from a wide range of benign or malignant etiologies and, if left untreated, can lead to irreversible renal damage. Common benign causes include ureteral calculi, ureteropelvic junction obstruction, ureteral strictures, and retroperitoneal fibrosis. In addition to frequently encountered urological malignancies such as prostate and bladder cancer, gynecological and colorectal tumors are also well-recognized causes of malignant ureteral obstruction (1,2).

The primary goals in the management of ureteral obstruction are to achieve effective urinary drainage and to preserve renal function. Retrograde double-J (DJ) stent placement and percutaneous nephrostomy are among the most commonly used treatment options. Over time, the indications for ureteral stenting have expanded substantially, and stent placement has become a standard therapeutic approach, particularly in the management of malignant or complicated benign obstructions (3,4).

Conventionally, DJ stents are placed via a retrograde cystoscopic approach. However, retrograde access may be technically challenging or impossible in certain clinical scenarios, including advanced pelvic malignancies, prior pelvic surgery, or severe ureteral strictures. In such cases, percutaneous antegrade ureteral stent placement has emerged as an effective alternative for achieving internal urinary drainage (5,6). When performed under fluoroscopic and ultrasonographic guidance, this minimally invasive technique has been shown to provide high technical success rates with an acceptable complication profile (7,8).

The success of antegrade stent placement largely depends on a multidisciplinary collaboration between urology and interventional radiology. Careful patient selection, thorough pre-procedural imaging assessment, appropriate technical planning, and coordinated post-procedural follow-up are essential factors that directly influence treatment outcomes (8).

The aim of this study is to evaluate the technical and clinical success of antegrade DJ stent placement in patients with failed retrograde access and to contribute to the development of optimal, collaborative management strategies

between urology and interventional radiology. In addition to common malignant and benign causes of ureteral obstruction, our study includes complex clinical scenarios such as ureterovesical anastomotic strictures following renal transplantation and urinary diversion. By encompassing this broad range of indications, the present series represents one of the most comprehensive evaluations of antegrade DJ stent placement reported in the literature.

MATERIALS AND METHODS

Study Design

This retrospective study included 40 patients who underwent antegrade DJ (double J) stent placement at our institution between 2021 and 2025 after unsuccessful retrograde ureteral stent insertion. The study was approved by the local ethics committee (Approval No: B.30.2.ATA.0.01.00/898). Patients with obstructive uropathy in whom retrograde ureteroscopic or cystoscopic stent placement failed and who subsequently underwent percutaneous antegrade stent placement were included. All benign and malignant etiologies requiring DJ stenting were considered. Patients with uncorrectable coagulopathy, those who could not tolerate the prone position or for whom an adequate access angle could not be achieved in the supine position, and patients with incomplete clinical or imaging data were excluded.

All patients underwent routine pre-procedural evaluation, including renal function tests, coagulation parameters, and complete blood count. In cases of culture-proven active urinary tract infection, the procedure was performed after appropriate antimicrobial treatment. All interventions were conducted under sterile conditions with ultrasonographic and fluoroscopic guidance. Procedure time (defined as the interval from needle puncture of the collecting system to successful placement of the DJ stent) and fluoroscopy time were obtained from procedural records. The need for sedation or general anesthesia was determined collaboratively with the anesthesia team based on the patient's clinical status. All procedures were performed by a single experienced interventional radiologist (F.A.).

Antegrade DJ stent placement was categorized into single-stage and 2-stage procedures.

Single-stage antegrade stenting was preferred in clinically stable patients without signs of urinary tract infection, in whom the obstruction was isolated and percutaneous access could be safely completed. In these cases, urinary drainage and stent placement were achieved during the same session. 2-stage antegrade stenting was primarily performed in patients presenting with sepsis, associated pyonephrosis, severe hydronephrosis, anticipated technical difficulty, or acute obstruction in a solitary kidney. In this group, initial percutaneous nephrostomy was performed to achieve urgent decompression, followed by antegrade DJ stent placement after clinical stabilization and infection control. The choice between single-stage and 2-stage procedures was determined based on clinical status, presence of infection, imaging findings, and operator judgment.

Patients were monitored for 24 hours after the procedure for vital signs and urinary drainage. Stent position and adequacy of drainage were assessed 24 hours post-procedure using ultrasonography and plain abdominal radiography of the urinary tract. Pain intensity was evaluated using a 10-point Visual Analog Scale (VAS). Pain scores at presentation and 24 hours after the procedure were recorded and categorized as mild (1–3), moderate (4–6), or severe (7–10), according to commonly accepted classifications in the literature.

Technical success was defined as the successful positioning of the DJ stent at the end of the procedure, with the proximal end in the renal pelvis and the distal end in the bladder lumen, followed by urinary drainage and regression of hydronephrosis. Clinical success was defined as a reduction in serum creatinine levels and resolution of pain symptoms.

Antegrade Double-J Stent Placement Technique

Percutaneous access to the pelvicalyceal system of the affected kidney was obtained under ultrasonographic guidance using an 18-gauge Chiba needle through an appropriate calyx (Figure 1a, b). A posterior approach targeting the lower pole calyx was preferentially selected. After needle placement, contrast material was injected to opacify the collecting system (Figure 1c). A 0.035-inch guidewire was advanced into the collecting system, the Chiba needle was removed, and the access tract was appropriately dilated over the guidewire (Figure 1d, e). A diagnostic vascular catheter was then advanced into the renal pelvis (Figure 1f), and antegrade pyelography was performed to identify the level of ureteral obstruction. Based on the location of the stricture and the presence of ureteral tortuosity, an appropriate guidewire was selected to traverse the obstruction. Using the guidewire-catheter combination, the catheter was advanced to the level of the stricture (Figure 1g, h). The obstruction was crossed using hydrophilic or polytetrafluoroethylene (PTFE) guidewires with different tip configurations and access to the bladder was achieved (Figure 1i, j). Subsequently, the guidewire was exchanged through the catheter for a stiff hydrophilic or super-stiff PTFE guidewire. Over the stiff guidewire, a double-J stent of appropriate length (typically 4.8–6 Fr, 22–28 cm) was advanced from the renal pelvis into the bladder (Figure 1k, l). Stent diameter and length were selected according to the patient's anatomy, ureteral characteristics, and extent of obstruction. No systematic reduction in stent caliber was performed during antegrade placement, and stents of similar dimensions to those routinely used in retrograde ureteral stenting were generally preferred. Correct positioning was confirmed under fluoroscopic guidance.

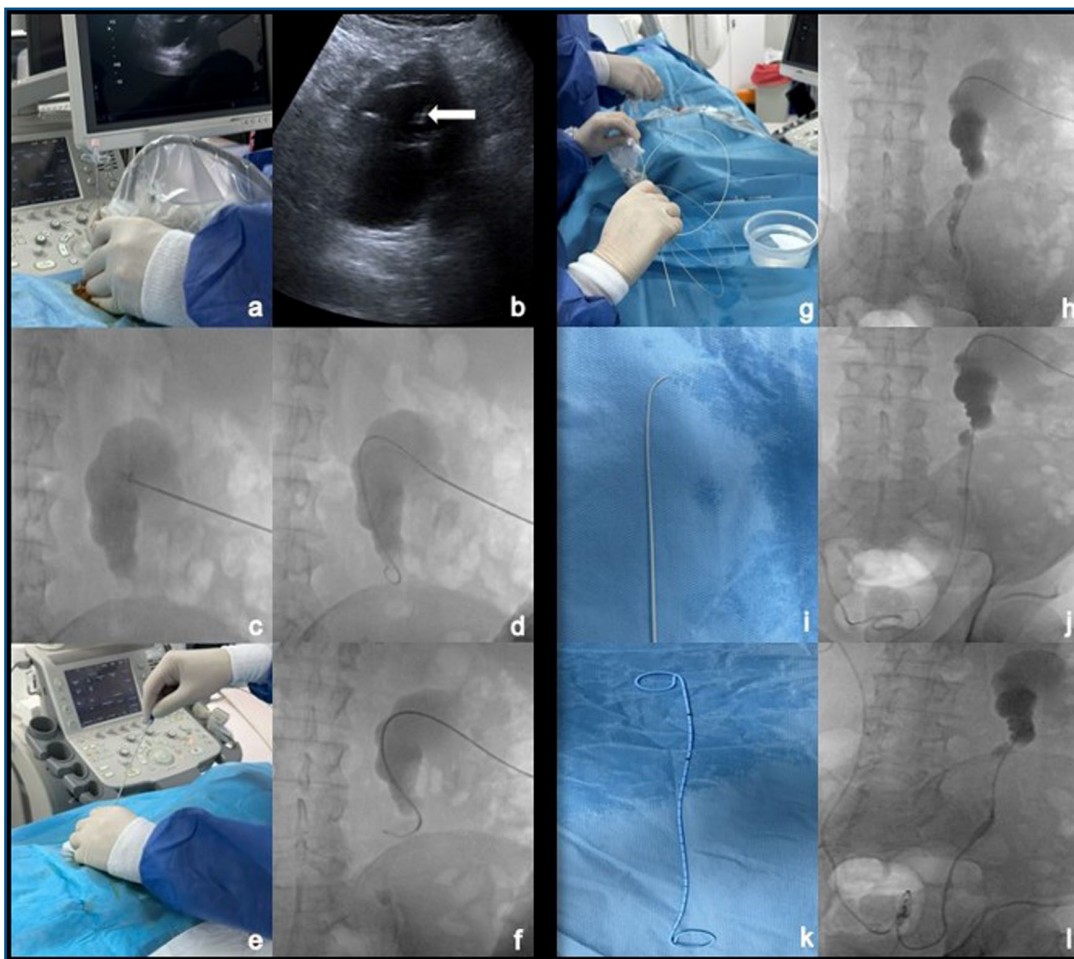


Figure 1. Step-by-step illustration of antegrade double-J stent placement performed under interventional radiology guidance. (a) Ultrasound-guided identification of an appropriate calyx and access to the collecting system using a Chiba needle. (b) Visualization of the needle tip within the collecting system (arrow). (c) Opacification of the collecting system following contrast injection. (d) Placement of a J-tip guidewire into the collecting system. (e) Tract dilation

performed over the guidewire. (f) Advancement of a diagnostic catheter into the renal pelvis. (g) Advancement of the diagnostic catheter together with an appropriate guidewire. (h) Advancement of the diagnostic catheter to the level of the ureteral stricture. (i) Use of an angled hydrophilic guidewire to cross the stricture. (j) Advancement of the hydrophilic guidewire through the stricture into the bladder. (k) Selection of the appropriate double-J stent. (l) Placement of the double-J stent over a stiff hydrophilic guidewire.

Procedure-related complications associated with antegrade double-J stent placement were evaluated according to the standard classification system defined by the Society of Interventional Radiology (SIR). Complications occurring during or after the procedure were recorded as minor (A-B) or major (C-F).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics software. Continuous variables were assessed for normality. Normally distributed variables were expressed as mean $\pm$ standard deviation, whereas non-normally distributed variables were presented as median (Q1–Q3). Comparisons between pre-procedural and post-procedural continuous variables were performed using the Wilcoxon signed-rank test. Categorical variables were presented as numbers and percentages. A p -value of < 0.05 was considered statistically significant for all analyses.

A post-hoc power analysis was performed using G*Power software (version 3.1, Heinrich-Heine University, Düsseldorf, Germany) based on the observed change in serum creatinine levels. With a sample size of 40 patients, an effect size of 1.20, and a significance level of 0.05, the calculated statistical power of the study was 0.99 (99%).

RESULTS

A total of 40 patients were included in the study. The mean age was 65.5 ± 11.4 years, and 27 patients (67.5%) were male. Indications for antegrade DJ stent placement were benign in 18 patients (45.0%) and malignant in 22 patients (55.0%). The benign group also included patients with ureterovesical anastomotic strictures following renal transplantation. Single-stage antegrade stenting was performed in 33 patients (82.5%) (Table 1).

The mean procedure time was 30.0 ± 9.4 minutes, and the mean fluoroscopy time was 6.2 ± 2.3 minutes. Antegrade double-J stent placement was successfully completed in all patients. A significant reduction in the degree of hydronephrosis was observed in all cases after the procedure, resulting in a 100% technical success rate ($p < 0.001$) (Table 2).

The median pre-procedural serum creatinine level was 1.96 mg/dL (Q1–Q3: 1.67–2.52), which decreased to 1.48 mg/dL (Q1–Q3: 1.33–1.65) after the procedure. This reduction in serum creatinine levels was statistically significant ($p < 0.001$). Similarly, the median VAS pain score decreased significantly from 5.0 (Q1–Q3: 4.0–6.0) pre-procedure to 1.0 (Q1–Q3: 1.0–2.0) post-procedure ($p < 0.001$) (Table 3).

The mean hemoglobin level was 12.89 ± 1.39 g/dL before the procedure and 12.74 ± 1.44 g/dL after the procedure, with no statistically significant difference observed. Post-procedural hematuria resolving within six hours occurred in three patients (7.5%). All complications were classified as minor according to the SIR classification system and were managed conservatively. No major complications were observed.

DISCUSSION

Retrograde ureteral stenting has long been considered a reliable method for relieving ureteral obstruction. However, retrograde access may fail in patients with pelvic malignancies or in the presence of severely tortuous ureteral anatomy. In such cases, percutaneous nephrostomy represents an alternative option for achieving urinary drainage (9,10).

Table 1. Patient Demographics and Clinical Characteristics

Parameter	Value
Age $\pm$ SD (years)	65.5 $\pm$ 11.4
Male sex, n (%)	27 (67.5%)
Female sex, n (%)	13 (32.5%)
Benign indication, n (%)	18 (45.0%)
Ureteral stone	2 (5.0%)
Benign prostatic hyperplasia	2 (5.0%)
Chronic cystitis	1 (2.5%)
Tortuous ureteral anatomy	1 (2.5%)
Retroperitoneal fibrosis	1 (2.5%)
Urinary diversion	5 (12.5%)
Renal transplant ureterovesical anastomotic stricture	6 (15.0%)
Malignant indication, n (%)	22 (55.0%)
Bladder cancer	11 (27.5%)
Prostate cancer	5 (12.5%)
Uterine cancer	4 (10.0%)
Colorectal cancer	2 (5.0%)
Single-stage procedure, n (%)	33 (82.5%)

Table 2. Procedural Characteristics and Technical Outcomes

Parameter	Value
Procedure time $\pm$ SD (min)	30.0 $\pm$ 9.4
Fluoroscopy time $\pm$ SD (min)	6.2 $\pm$ 2.3
Technical success, n (%)	40 (100.0)

Table 3. Pre- and Post-procedural Clinical Outcomes

Parameter	Pre-procedure	Post-procedure	p-value
Serum creatinine (mg/dL)	1.96 (1.67–2.52)	1.48 (1.33–1.65)	<0.001
VAS score	5.0 (4.0–6.0)	1.0 (1.0–2.0)	<0.001

Percutaneous nephrostomy is a minimally invasive and generally safe procedure with low complication rates (11,12). Nevertheless, the need for long-term external drainage constitutes a major drawback that may negatively affect patient comfort and quality of life. Consequently, antegrade DJ stent placement has emerged as a valuable alternative in patients with failed retrograde access, offering internal drainage and improved patient comfort (13). The antegrade approach allows direct access to the renal collecting system, facilitating more controlled advancement of guidewires and catheters across the obstruction site (14). In patients with distorted lower urinary tract anatomy, pelvic masses, or post-surgical fibrotic changes, this technique provides a significant advantage by eliminating the need for prolonged nephrostomy and enabling effective internal drainage (15,16). Patients who have undergone urinary

diversion or renal transplantation often develop complex anatomical alterations, and strictures at the anastomotic site represent an important source of morbidity in this population (17). The incidence of ureteral strictures following renal transplantation has been reported to range from approximately 1% to 4.5% (18). Our findings demonstrate that antegrade DJ stent placement can be safely and effectively applied in these patients when retrograde access is unsuccessful.

In the literature, common causes of failed retrograde stenting include distortion of the bladder trigone, tumor involvement of the ureteral orifice, and inability to traverse the distal ureter (10,19). In such scenarios, antegrade stenting has been shown to provide a clear technical advantage. Reported technical success rates for antegrade ureteral stenting are approximately 95%, with overall complication rates around 8% and major complication rates generally below 5% (20). In the present study, technical success was achieved in all cases, and the complication rate was lower than those reported in previous series. This favorable outcome may be attributed to institutional experience with antegrade DJ stent placement, careful patient selection, and the individualized choice between single-stage and 2-stage procedures. Furthermore, close collaboration between urology and interventional radiology in determining appropriate indications likely contributed to these results.

One of the distinguishing features of this study is the inclusion of anatomically complex and relatively uncommon indications, such as ureterovesical anastomotic strictures following renal transplantation and obstructive pathologies after urinary diversion, in addition to more common benign and malignant causes of ureteral obstruction. Most published series on antegrade ureteral stenting primarily focus on urological or gynecological malignancies, whereas data addressing these special patient populations within a single cohort remain limited. Despite the broad and heterogeneous range of indications, technical success was achieved in all patients in our series, supporting the consistent efficacy and safety of antegrade DJ stent placement across diverse clinical scenarios (21).

Retrograde access may also be limited in patients with bladder tumors involving the ureteral orifice or following transurethral resection (TUR) of early-stage (Ta-T1) bladder tumors, where optimal visualization of the ureteral orifice may be compromised. In such cases, antegrade DJ stenting represents an effective alternative for achieving internal urinary drainage (19). In our study, bladder cancer constituted the most frequent malignant indication, with many cases involving early-stage tumors associated with ureteral orifice involvement. Successful internal drainage was achieved in these patients using the antegrade approach, suggesting that this technique may be particularly useful in obstructions related to post-TUR anatomical distortion rather than extrinsic compression from advanced tumors.

The overall complication rate observed in our study was low, and all complications were classified as minor according to the SIR criteria and resolved with conservative management. These findings further support the favorable safety profile of antegrade DJ stent placement.

Several limitations of this study should be acknowledged. The retrospective, single-center design and the heterogeneous patient population may limit the generalizability of the results. Furthermore, selection bias may have occurred because only patients referred for antegrade intervention after failed retrograde stenting attempts were included in the study. Baseline serum creatinine levels prior to the development of ureteral obstruction were not consistently available; therefore, the extent to which post-procedural renal function returned to each patient's baseline status could not be determined. Nevertheless, the significant reduction in serum creatinine levels observed after the procedure supports the clinical effectiveness of antegrade DJ stent placement in relieving urinary obstruction. In patients who underwent a 2-stage approach, the independent contributions of initial percutaneous nephrostomy and subsequent antegrade DJ stent placement to the observed clinical improvement could not be evaluated separately. In addition, long-term complications such as stent migration or bladder irritation may have been underreported due to the retrospective nature of the analysis. Long-term follow-up data regarding stent patency, functional outcomes,

and quality of life remain limited in the existing literature (22). Future multicenter, prospective studies involving different patient subgroups—including benign versus malignant strictures, solitary kidney patients, and pediatric populations—are warranted to establish standardized protocols for antegrade ureteral stenting. Despite these limitations, our study stands out as having the broadest spectrum of indications reported in the literature regarding antegrade DJ stent applications.

In conclusion, when considered alongside existing evidence, the present study demonstrates that antegrade DJ stent placement is a safe and effective treatment option for both benign and malignant ureteral obstruction in patients with failed retrograde access. The combination of high technical success, low complication rates, and improved patient comfort highlights the value of this approach. A multidisciplinary strategy involving close collaboration between urology and interventional radiology is essential for optimizing clinical outcomes.

CONCLUSION

Antegrade DJ stent placement is a safe and effective treatment option for selected patients with failed retrograde ureteral stenting, providing high technical and clinical success rates in both benign and malignant ureteral obstruction. Owing to its low complication profile and ability to achieve adequate internal drainage, the antegrade approach represents a reliable alternative, particularly in patients with urinary diversion or renal transplantation. Implementation of this technique within a multidisciplinary framework involving urology and interventional radiology contributes significantly to improved clinical outcomes.

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Conflict of Interest Disclosure: The authors declare no conflict of interest.

Ethical Approval: The Ethics Committee of the Ataturk University Faculty of Medicine approved (Approval No: B.30.2.ATA.0.01.00/898) the presented study.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Author Contributions: Conception: FA,MY; Design: ŞOD; Supervision: FA,ŞOD; Data Collection: FA,ŞOD ; Analysis: MY,Eİ; Literature Review: FA,Eİ,ŞOD; Writer: FA,MY,ŞOD; Critical Review: ŞOD

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