



## Review of Literature for the Comparison of Dilatation Methods Using Percutaneous Nephrolithotomy

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### Introduction

Kidney stone is an important issue in urology. The management is changed according to the size and location of kidney stone. There are some treatment modalities. The first choice in treatment of > 2 cm sized kidney stones is PNL [1]. PNL is first defined by Fernström, et al. in 1976 [2]. Its usage increased and took place of open surgery [1]. An important step of PNL is nephrostomy tract formation. This step affects bleeding risk, surgery time, success and complication rate [3]. Four different methods (Alken, Amplatz, Balloon, One-step) are used. In Balloon and One-step dilatation, process is made in one stage. In Alken and Amplatz dilatation, process is made small to bigger increasing diameter sequentially. There is no consensus about which one is the best [4]. In our study, we aimed to compare these methods in the light of certain parameters. We reviewed the literature while making the comparison. These parameters were efficiency, bleeding, scopy-operation time, complication and cost.

### Efficiency

When looking literature, there are some factors effecting success. Patients characteristics, history of previous surgery (secondary), mobile kidney and experience of the surgeon affect success [5-7]. There is no statistically significant difference in success rates when we look at the studies comparing the dilatation methods in the literature [8]. In a study comparing Amplatz and Alken dilatation, the success rate was higher in Amplatz dilatation group and the difference was statistically significant [9]. Patient characteristics are different in the studies. In some studies, secondary patients, obese patients and patients using anticoagulant drugs were excluded. In secondary (having history of previous surgery) patients, dilatation gets difficult due to the scar tissue. In secondary patients, alken dilatation is recommended [10].

In a review, one step dilatation is recommended in case of open surgery history [8]. Alken dilatation is recommended in mobile kidneys [10]. In children, lower sized dilatation is needed. So amplatz dilatation is recommended in children [10]. Factors such as diabetes mellitus, body mass index and hypertension were not evaluated in literature. In table 1 we showed the studies comparing the dilatation methods for efficiency.

### Bleeding

Bleeding is a complication seen in PNL. Bleeding can be seen 0 to 25% independent of dilatation method [11]. There are some factors affecting bleeding. There are some views about bleeding during nephrostomy tract formation. In a study, it is reported that half of the bleeding is related to dilatation method [12]. In some studies it is reported that there is not any relation between bleeding and dilatation method [3,13]. Akman, et al. reported that the most important factor affecting bleeding is stone type [14]. Yamaguchi, et al. reported that size of the sheath, stone burden, operation time and case burden affect bleeding [15]. In studies comparing amplatz and balloon dilatation, there is lower bleeding rates in balloon dilatation group. The difference was not statistically

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**Table 1:** Studies comparing dilatation methods for efficiency.

Study	Intervention	Success
Frattini, et al. [18]	One-step vs. Alken	No statistically significant difference
Amjadi, et al. [19]	One-step vs. Alken	No statistically significant difference
Falahatkar, et al. [20]	One-step vs. Alken	No statistically significant difference
Aminsharif, et al. [21]	One-step vs. Alken	No statistically significant difference
Ozok, et al. [10]	Alken vs. Amplatz	No statistically significant difference
Hijazi, et al. [9]	Alken vs. Amplatz	Amplatz more successful (statistically significant)
Nalbant, et al. [3]	Amplatz vs. Alken vs. Balloon	No statistically significant difference

**Table 2:** Studies comparing dilatation methods for bleeding.

Study	Intervention	Bleeding
Frattini, et al. [18]	One-step vs. Alken	One step lower bleeding
Amjadi, et al. [19]	One-step vs. Alken	One step lower bleeding
Falahatkar, et al. [20]	One-step vs. Alken	One step lower bleeding
Aminsharif, et al. [21]	One-step vs. Alken	One step lower bleeding
Ozok, et al. [10]	Alken vs. Amplatz	No statistically significant difference
Hijazi, et al. [9]	Alken vs. Amplatz	No statistically significant difference
Nalbant, et al. [3]	Amplatz vs. Alken vs. Balloon	No statistically significant difference
Frattini, et al. [18]	Balloon vs. Alken	Balloon higher bleeding (statistically significant)
Wezel F, et al. [11]	Balloon vs. Alken	Balloon higher bleeding (statistically significant)
Lopes T, et al. [4]	Balloon vs. Alken	Balloon higher bleeding (statistically significant)
Yamaguchi A, et al. [15]	Balloon vs. Alken	Balloon higher bleeding (statistically significant)
Şafak M, et al. [6]	Balloon vs. Amplatz	Balloon lower bleeding (Not statistically significant)
Gönen M, et al. [17]	Balloon vs. Amplatz	Balloon lower bleeding (Not statistically significant)
Davidoff, et al. [16]	Balloon vs. Amplatz	Balloon lower bleeding (Not statistically significant)

significant [6,16,17]. In studies comparing balloon and alken dilatation methods, bleeding is higher in balloon dilatation group and the difference was statistically significant [4,11,15,18]. In studies comparing one step and metal dilatation methods, bleeding rate was lower in one step group [18-21]. In a study comparing amplatz, alken and balloon dilatation, there is no difference in bleeding rates [3]. In alken dilatation method, metal dilators apply continuous pressure to small vessels. This effect is not seen in amplatz dilatation. Also bleeding risk increases during changing dilators [10]. In table 2 we showed the studies comparing the dilatation methods for bleeding.

### Operation & Scopy Time

In a study comparing amplatz, alken and balloon dilatation methods, operation and scopy time were statistically significantly lower in balloon dilatation group. The difference was related to tract formation time [3]. In the studies comparing amplatz and balloon dilatation methods, there was no difference in operation time [6,16,17]. In the studies comparing alken and amplatz dilatation methods, there is not statistically significant difference in operation and scopy time [9,10].

### Complication

When evaluating complications, there is not statistically significant difference for complications in the studies comparing the dilatation methods. In a study

comparing alken and amplatz dilatation methods, minor complications were statistically significantly higher in alken dilatation group [9].

### Cost

When we evaluate the cost, from cheap to expensive we can put in order as alken-amplatz and balloon dilatation [21]. Alken dilatation set is reusable. So its cost is low. Amplatz dilators can be reesterilized. But its quality may decrease [10].

### Conclusion

In conclusion, there is not a consensus about which one is the optimum method. Prospective, high patient number and including detailed patient characteristics studies are needed about dilatation methods.

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### Conflict of Interest

The authors declare that they have no conflict of interest.

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