



The efficacy and safety of dutasteride and finasteride in patients with benign prostatic hyperplasia: a systematic review and meta-analysis

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Background: Although the efficacy and safety of monotherapy in the treatment of benign prostatic hyperplasia (BPH) have been established clinically, the efficacy and safety of dutasteride and finasteride have not been compared. The aim was to systematically evaluate the efficacy and safety of the two drugs in the treatment of BPH to provide medical evidence for clinical treatment.

Methods: A search of relevant articles was conducted using the electronic databases PubMed, Embase, Medline, Cochrane Library, China Academic Journals Full-text Database (CJFD), Chinese Science and Technology Journal Database (VIP) and Wanfang Database. Randomized controlled trials (RCTs) comparing the efficacy of finasteride (control group) with that of dutasteride (experimental group) in the treatment of BPH with respect to the International Prostate Symptom Score (IPSS), the maximum urinary flow rate (Q_{max}), prostate volume (PV), quality of life (QOL), serum prostate-specific antigen (PSA) level and adverse drug reactions (ADRs) after medication were strictly evaluated and considered for inclusion. Rev Man 5.4 software was used for the meta-analysis.

Results: A total of 8 RCTs were included, with a total of 2,116, patients. The meta-analysis showed that compared with finasteride, dutasteride can effectively improve the Q_{max} of patients with BPH [mean difference (MD) =0.32; 95% confidence interval (CI): (0.01, 0.63); P=0.04]. There was no significant difference in reducing IPSS [MD =0.13; 95% CI: (-0.55, 0.82); P=0.70], improving PV [MD =-1.25; 95% CI: (-3.30, 0.79); P=0.23], reducing QOL [MD =-0.44; 95% CI: (-0.93, 0.05); P=0.08] and serum PSA level [MD =-0.04; 95% CI: (-0.15, 0.07); P=0.50], and the occurrence of ADRs [relative risk (RR) =-0.01; 95% CI: (-0.05, 0.04); P=0.72], there was no significant difference.

Discussion: Dutasteride is better than finasteride in improving the Q_{max} of patients with BPH. There was no statistically significant difference in symptoms, PV, PSA, QOL, or adverse reactions. Dutasteride is an effective and safe treatment for BPH. Due to the limitations of the methodological quality and sample size of the included studies, this conclusion needs to be verified by stratified RCTS with high volumes and long follow-up times.

Keywords: Dutasteride; finasteride; benign prostatic hyperplasia (BPH); meta-analysis

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Introduction

Benign prostatic hyperplasia (BPH) is a common disease in middle-aged and elderly men. A meta-analysis has shown that the incidence of BPH in Chinese men increases significantly with age, with an incidence of 69.2% in men over 80 years old (1). There are many treatments for BPH: (I) drug therapy, including alpha blockers, 5-alpha reductase inhibitors, and combination drug therapy; (II) minimally invasive therapies, such as transurethral microwave thermotherapy, transurethral needle ablation, holmium laser enucleation of prostate; (III) surgery procedures include: transurethral resection of the prostate, transurethral incision of the prostate, simple prostatectomy, laser surgery. Drug therapy is one of the curative treatments for BPH. Finasteride and dutasteride are the most frequently considered in treating BPH. Finasteride is a 5 α -reductase (5 α -R) inhibitor, which is the first-line therapy for BPH. Nevertheless, it has been reported that finasteride can increase the risk of loss of libido and ejaculatory dysfunction (2,3). Dutasteride is a 5 α -R inhibitor as well. It has been found that dutasteride has advantages in improving symptoms related to prostatic hyperplasia and reducing acute urinary retention in the treatment of BPH (4,5). The 5 α -R inhibitor decreases the level of dihydrotestosterone (DHT), which is responsible for prostate growth. Finasteride reduces 70% of circulating DHT levels, while dutasteride almost completely reduces DHT levels in both the serum and the prostate. A study found that in treating BPH, compared with finasteride, dutasteride showed a greater decrease in prostate-specific antigen (PSA) and International Prostate Symptom Score (IPSS) (6). Whereas, results of Yin *et al.* suggested no significant differences between dutasteride and finasteride in treating BPH, except dutasteride improves BPH symptoms in IPSS (7). Therefore, this study systematically compared the efficacy of dutasteride and finasteride for BPH to provide medical evidence for clinical treatment.

We present the following article in accordance with the PRISMA reporting checklist (available at <https://tau.amegroups.com/article/view/10.21037/tau-22-58/rc>).

Methods

Inclusion criteria

Patients

Men between the ages of 50 and 70 with obvious symptoms

of prostatic hyperplasia [IPSS >8; average urination time <12 mL/s; a diagnosis of prostate hyperplasia confirmed by prostate B-ultrasound or computed tomography (CT) examination] were identified as subjects (8).

Intervention

Intervention was based on dutasteride or finasteride were included in our study.

Comparator

Comparator was the pharmacological therapy that either dutasteride or finasteride applied to patients.

Outcomes

Outcomes included the assessment of IPSS, maximum urinary flow rate (Q_{max}), prostate volume (PV), quality of life (QOL), PSA and adverse drug reactions (ADRs).

Study design

Study design was randomized controlled trials (RCTs) of dutasteride versus finasteride in the treatment of BPH. The origin of the scientific legend was traced, and the language was limited to English or Chinese.

Exclusion criteria

(I) Reviews, case-control studies, systematic evaluations and letters were excluded; (II) duplicate publications or articles with no available data were excluded.

Search strategy

A search of relevant articles was conducted from January 2009 to July 2021 using the electronic databases PubMed, Embase, Medline, Cochrane Library, China Academic Journals Full-text Database (CJFD), Chinese Science and Technology Journal Database (VIP) and Wanfang Database. Search terms included “Benign Prostatic hyperplasia”, “Random”, “Control”, “Dutasteride”, “Finasteride”, “Adult” and “Male”.

Data extraction and quality assessment

Two researchers independently screened the titles and abstracts for eligibility. When there was a difference of opinion, a third reviewer was consulted. The authors were contacted about missing or unclear data. The risk of bias

and literature quality were evaluated according to the Cochrane Systematic Review (9): (I) RCT; (II) allocation scheme; (III) blind method; (IV) complete data; (V) selection bias; and (VI) other biases. For RCTs, we used the Jadad scale with the classification criteria of high quality (3 or more) and low quality (2 or less).

Statistical analysis

Meta-analyses were carried out using RevMan version 5.0 statistical processing software. The presence of substantial heterogeneity was assessed. If the P value was >0.1 , the test of homogeneity was statistically significant, and then the fixed effects model was adopted. On the other hand, the random effects model was adopted if there was heterogeneity. Mean difference (MD) or relative risk (RR) and 95% confidence intervals (CIs) were used to analyze the end indices. A two-sided P value <0.05 was considered to indicate statistical significance.

Results

Characteristic of eligible studies

A total of 240 potentially relevant articles were selected, including 28 Chinese articles and 212 English articles. After reading the abstracts and titles, 222 publications were excluded. Of the remaining 18 studies, 10 were excluded due to being non-RCTs or having incomplete data or an absence of BPH disease. Finally, 8 RCTs comparing the efficacy of dutasteride and finasteride in the treatment of BPH over 6 months of treatment or longer were included in this meta-analysis; 2,116 subjects were involved. The study selection process is illustrated in *Figure 1*. The main characteristics of the 8 studies are presented in *Table 1*.

Quality assessment and risk of bias assessment

The Jadad scores of the 8 included articles were all greater than 3, as shown in *Table 1*. The risks of bias of the 8 included studies are shown in *Figures 2,3*.

In the Cochrane risk of bias (RoB 2.0) analysis, all literature had no data miss and selection bias. Most literature was a low risk of bias. Little literature had high-risk selection bias and performance bias (*Figure 2*).

Only one literature had a high-risk bias in selection bias and another one literature had performance bias

individually (*Figure 3*).

Meta-analysis results of outcomes

IPSS

Five RCTs (10-12,16,17) were included to analyze the IPSS scores after treatment. There was no significant heterogeneity ($P=0.63$; $I^2=0\%$). The forest plots indicated that there was no significant difference in IPSS between the subset analyses of BPH patients who were administered dutasteride versus finasteride [MD =0.13; 95% CI: (-0.55, 0.82); $P=0.70$] (*Figure 4*).

Qmax

Five RCTs (10-13,16) with a total of 1,887 patients were included to analyze Qmax after treatment. There was no significant heterogeneity ($P=0.57$; $I^2=0\%$). The forest plots indicated a significantly greater increase in Qmax in the dutasteride group than in the finasteride group [MD =0.32; 95% CI: (0.01, 0.63); $P=0.04$] (*Figure 5*).

PV

Six RCTs (10-15) with a total of 1,964 patients were included to analyze PV after treatment. There was no significant heterogeneity ($P=0.84$; $I^2=0\%$). The forest plots indicated that there was no significant difference in PV between the subset analyses of BPH patients who were administered dutasteride versus finasteride [MD =-1.25; 95% CI: (-3.30, 0.79); $P=0.23$] (*Figure 6*).

QOL

Four RCTs (10-12,17) were included to analyze the QOL of these patients after treatment. There was significant heterogeneity ($P=0.01$; $I^2=73\%$). The random effects model was used. The forest plots indicated that there was no significant difference in QOL between the subset analyses of BPH patients who were administered dutasteride versus finasteride [MD =-0.44; 95% CI: (-0.93, 0.05); $P=0.08$] (*Figure 7*).

Serum PSA level

Four RCTs (12,13,16,17) were included to analyze the serum PSA levels after treatment. There was no significant heterogeneity ($P=0.70$; $I^2=0\%$). The forest plots indicated that there was no significant difference in the serum PSA levels between the subset analyses of BPH patients who

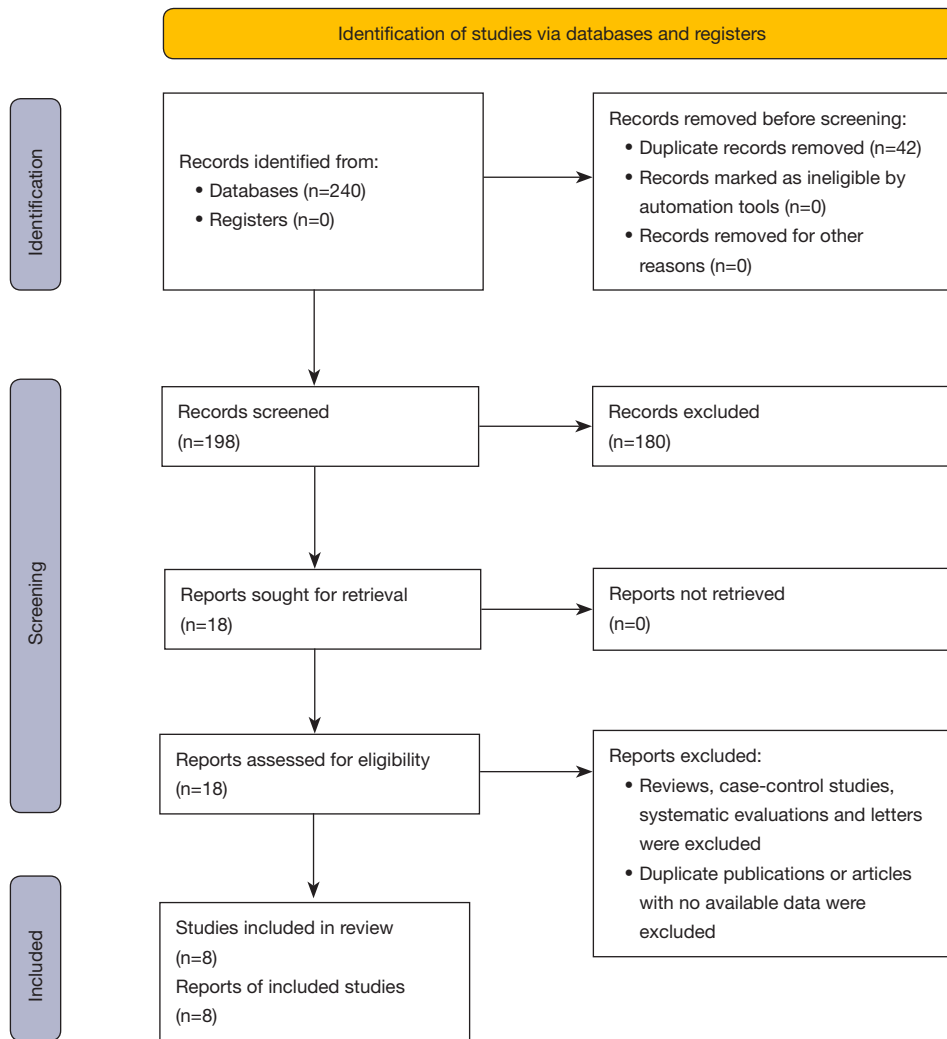


Figure 1 Literature search flow chart.

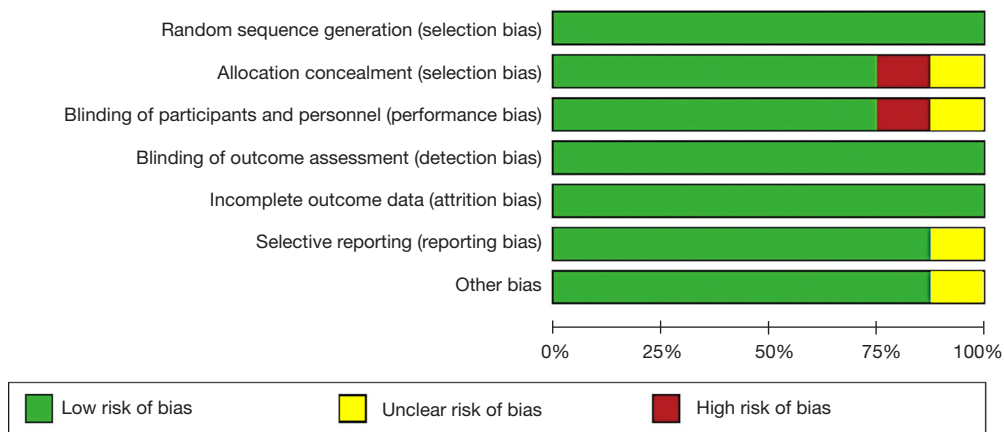


Figure 2 Risk of bias for the 8 included studies.

Table 1 Basic characteristics of the 7 RCTs included for analysis

First author (year)	Study design	Experimental group	Control group	Cases	Age, years	Intervention	Course, months	Outcome indicator	Jadad score
Kuang CQ (10), 2015	RCT	Dutasteride	Finasteride	Dutasteride (n=28)	>60	Dutasteride, 0.5 mg, qd	6	PV, Qmax, IPSS, QOL, ADR	4
				Finasteride (n=28)		Finasteride, 5 mg, qd			
Peng T (11), 2015	RCT	Dutasteride	Finasteride	Dutasteride (n=39)	≥60	Dutasteride, 0.5 mg, qd	>6	PV, IPSS, QOL, Qmax	3
				Finasteride (n=45)		Finasteride, 5 mg, qd			
Li YZ (12), 2013	RCT	Dutasteride	Finasteride	Dutasteride (n=36)	≥60	Dutasteride, 0.5 mg, qd	6	PV, IPSS, QOL, Qmax, PSA, ADR	4
				Finasteride (n=36)		Finasteride, 5 mg, qd			
Nickel JC (13), 2011	RCT	Dutasteride	Finasteride	Dutasteride (n=813)	>50	Dutasteride, 0.5 mg, qd	12	PV, Qmax, ADR	3
				Finasteride (n=817)		Finasteride, 5 mg, qd			
Sciarra A (14), 2010	RCT	Dutasteride	Finasteride	Dutasteride (n=20)	>50	Dutasteride, 0.5 mg, qd	6	PSA	4
				Finasteride (n=20)		Finasteride, 5 mg, qd			
Clark RV (15), 2004	RCT	Dutasteride	Finasteride	Dutasteride (n=57)	>50	Dutasteride, 0.5 mg, qd	6	ADR	4
				Finasteride (n=55)		Finasteride, 5 mg, qd			
Jeong YB (16), 2009	RCT	Dutasteride	Finasteride	Dutasteride (n=40)	>50	Dutasteride, 0.5 mg, qd	12	PV, IPSS, PSA	3
				Finasteride (n=37)		Finasteride, 5 mg, qd			
Qian X (17), 2015	RCT	Dutasteride	Finasteride	Dutasteride (n=16)	≥60	Dutasteride, 0.5 mg, qd	36	PV, Qmax, IPSS, QOL, PSA	4
				Finasteride (n=29)		Finasteride, 5 mg, qd			

RCT, randomized controlled trial; qd, once a day; PV, prostate volume; Qmax, maximum urinary flow rate; IPSS, International Prostate Symptom Score; QOL, quality of life; PSA, prostate-specific antigen; ADR, adverse drug reaction.

were administered dutasteride versus finasteride [MD = -0.04; 95% CI: (-0.15, 0.07); P=0.50] (Figure 8).

ADRs

Four RCTs (10-13,15) with a total of 1,870 patients were

included to analyze adverse reactions. There was no significant difference in heterogeneity (P=0.73; I²=0%). The forest plots indicated that there was no significant difference in ADRs between the subset analyses of BPH patients who were administered dutasteride versus finasteride [MD

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Clark RV, 2004	+	+	+	+	+	+	+
Jeong YB, 2009	+	+	+	+	+	?	+
Nickel JC, 2011	+	+	+	+	+	+	+
Qian X, 2015	+	+	+	+	+	+	+
Sciarra A, 2010	+	+	+	+	+	+	+
Peng T, 2015	+	+	+	+	+	+	?
Li YZ, 2013	+	-	?	+	+	+	+
Kuang CQ, 2015	+	?	-	+	+	+	+

Figure 3 Risk of bias summary for the 8 included studies. +: low risk of bias; -: high risk of bias; ?: unclear risk of bias.

=-0.01; 95% CI: (-0.05, 0.04); P=0.72] (Figure 9).

Publication bias

Funnel plots were drawn based on the literature whose main indicators are IPSS, Qmax, PV, QOL, serum PSA, and adverse events indicating that there was no significant publication bias and that the results were mostly stable and reliable (Figure 10). However, considering that few studies were included in this meta-analysis and most of them dispersed at the bottom of funnel plots, publication bias cannot be completely ruled out.

Sensitivity analysis

As indicated in Figure 11, the sensitivity analysis of the meta-analysis literature that included IPSS, Qmax, PV, QOL, serum PSA, and adverse events individually, the significance of the combined effect sizes did not change significantly after the corresponding literature for each indicator was excluded from inclusion in turn. That means there were no extremes in the included studies.

Discussion

BPH is a common disease in men over 50 years old, and its incidence increases with age (18). The main clinical manifestations of BPH are lower urinary tract symptoms, enlarged PV, decreased peak urine flow, high IPSS score,

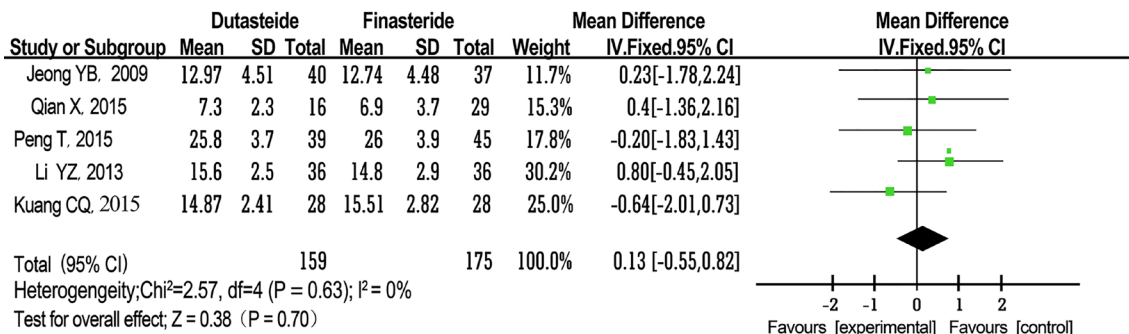


Figure 4 Forest plot of the IPSS of patients with BPH treated with dutasteride or finasteride. SD, standard deviation; CI, confidence interval; IPSS, International Prostate Symptom Score; BPH, benign prostatic hyperplasia.

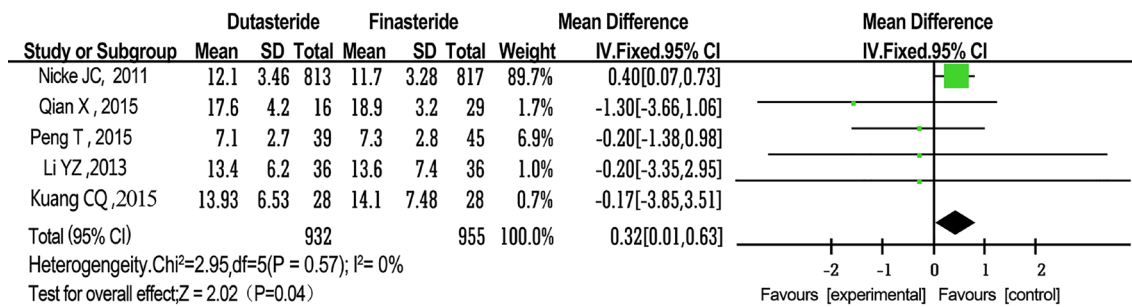


Figure 5 Forest plot of the Qmax in patients with BPH treated with dutasteride or finasteride. SD, standard deviation; CI, confidence interval; Qmax, maximum urinary flow rate; BPH, benign prostatic hyperplasia.

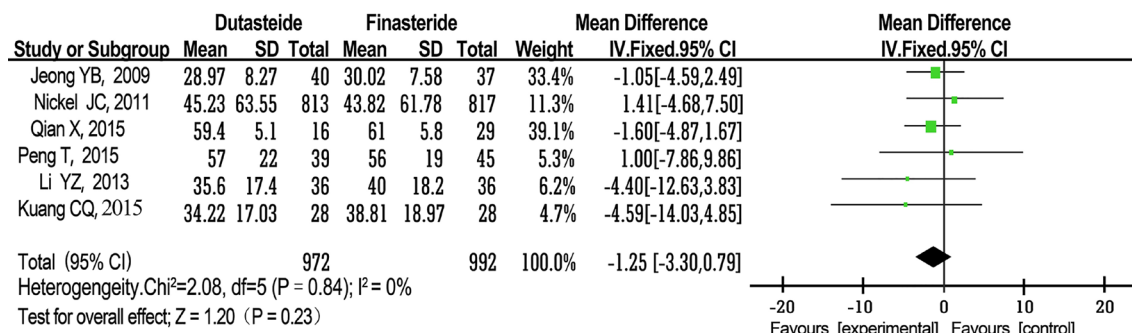


Figure 6 Forest plot of PV in patients with BPH treated with dutasteride or finasteride. SD, standard deviation; CI, confidence interval; PV, prostate volume; BPH, benign prostatic hyperplasia.

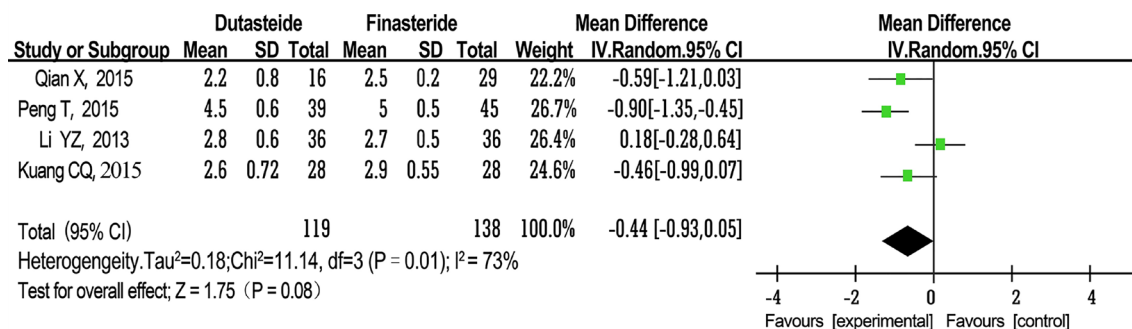


Figure 7 Forest plot of the QOL of patients with BPH treated with dutasteride or finasteride. SD, standard deviation; CI, confidence interval; QOL, quality of life; BPH, benign prostatic hyperplasia.

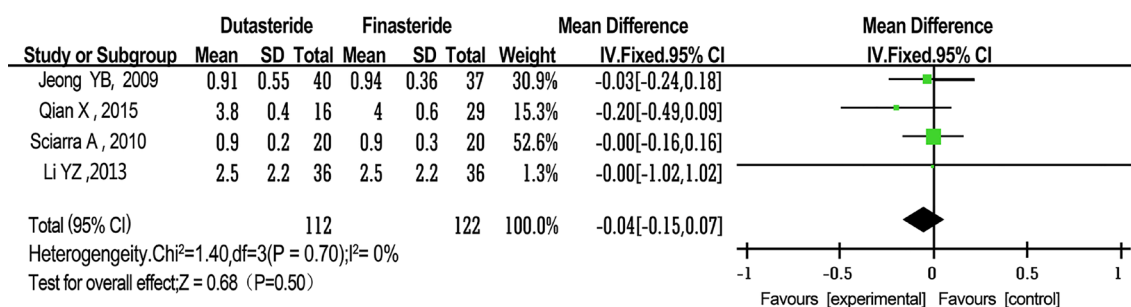


Figure 8 Forest plot of serum PSA levels of patients with BPH treated with dutasteride or finasteride. SD, standard deviation; CI, confidence interval; PSA, prostate-specific antigen; BPH, benign prostatic hyperplasia.

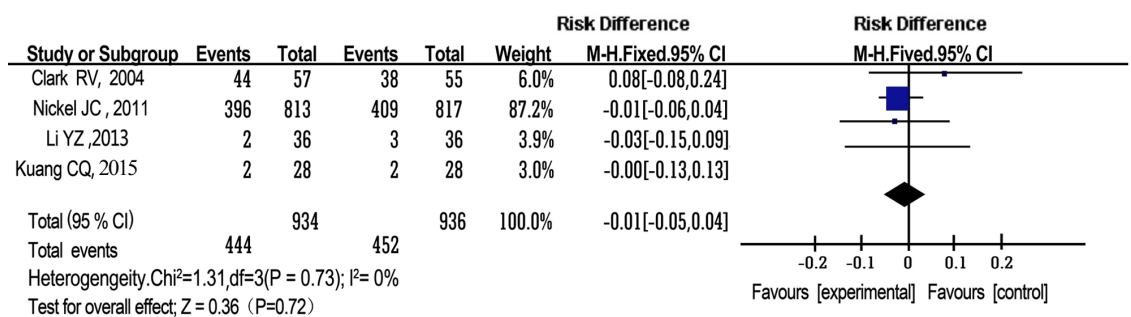


Figure 9 Forest plot of adverse effects of dutasteride and finasteride in patients with BPH. CI, confidence interval; BPH, benign prostatic hyperplasia.

and increased serum PSA (19). DHT whose formation is catalyzed by the enzyme 5 α -R, plays a vital role in the progression of BPH (20,21). 5 α -R inhibitors can effectively reduce the concentration of DHT in the prostate and promote prostate smooth muscle contraction (22-24). As 5 α -R inhibitors, dutasteride and finasteride are mainly used to improve the symptoms of prostatic hyperplasia. 5 α -R is a protease that can convert testosterone to DHT and accelerate the progression of prostate hyperplasia. It has two isoenzymes. Dutasteride is a selective inhibitor of both type I and type II isoenzymes of 5 α -R, whereas finasteride selectively inhibits the type II isoform (25). Although the efficacy of monotherapy has been established clinically (26,27), the efficacy of the two drugs has not been compared. Therefore, this study systematically examined and compared the efficacy of the two drugs in the treatment of BPH with a meta-analysis.

Eight RCTs involving 2,116 participants were included to compare the efficacy of dutasteride (0.5 mg/day) versus

finasteride (5 mg/day) in the treatment of BPH over a period of 6 months. The meta-analysis showed that compared with finasteride, dutasteride could effectively improve Qmax in patients with BPH [MD =0.32; 95% CI: (0.01, 0.63); P=0.04], and the difference was statistically significant. IPSS [MD =0.13; 95% CI: (-0.55, 0.82); P=0.70], PV [MD =-1.25; 95% CI: (-3.30, 0.79); P=0.23], QOL [MD =-0.44; 95% CI: (-0.93, 0.05); P=0.08], serum PSA level [MD =-0.04; 95% CI: (-0.15, 0.07); P=0.5] and the occurrence of ADRs [RR =-0.01; 95% CI: (-0.05, 0.04); P=0.72] showed no significant difference between the two groups. Thus, dutasteride is more effective than finasteride for improving the maximum urine flow rate in patients with BPH. No significant difference was found between dutasteride and finasteride in improving symptoms, PV, reducing PSA level and QOL, or the occurrence of ADRs. Dutasteride is an effective treatment for BPH. Qmax represents the maximum urine flow rate of patients with prostatic hyperplasia, indicating the degree of prostatic

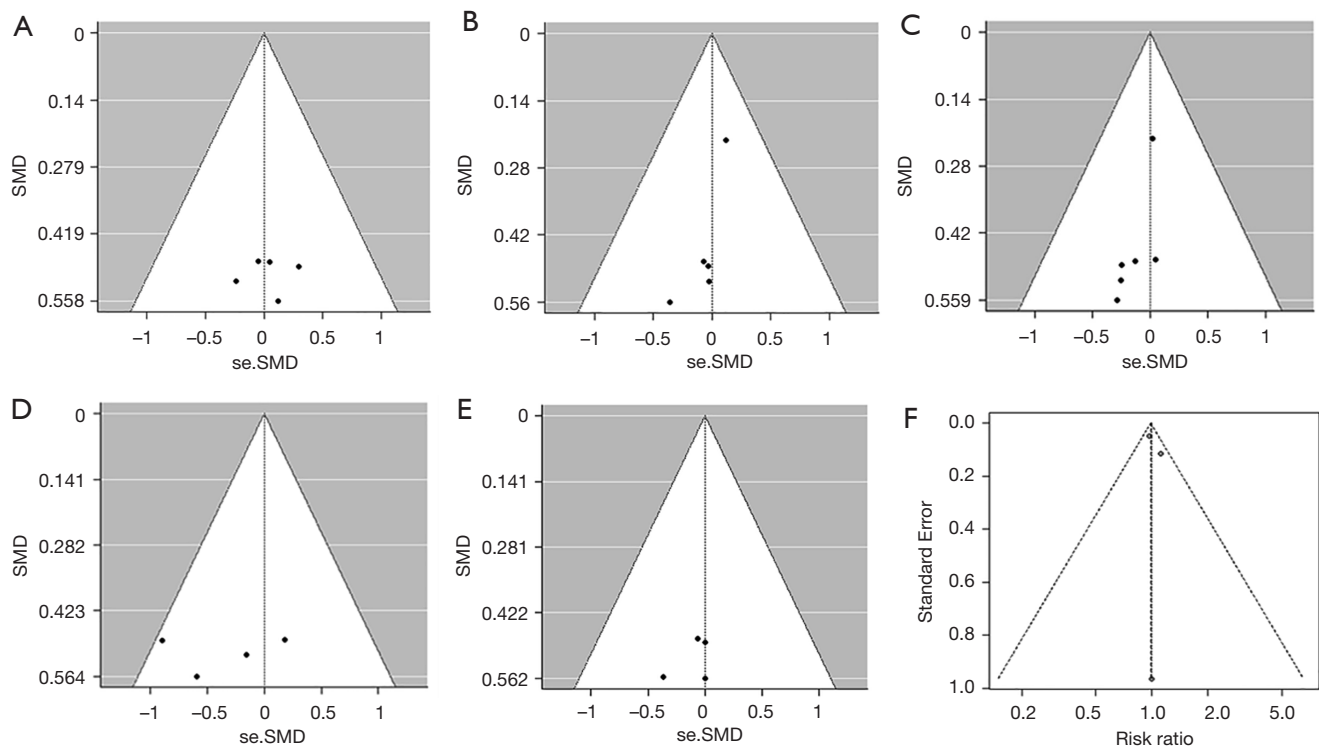


Figure 10 Funnel plots of randomized controlled studies included in the meta-analysis. (A) Funnel plots of studies included IPSS. (B) Funnel plots of studies included Qmax. (C) Funnel plots of studies included PV. (D) Funnel plots of studies included QOL. (E) Funnel plots of studies included PSA. (F) Funnel plots of studies included adverse events. SMD, standard mean difference; IPSS, International Prostate Symptom Score; Qmax, maximum urinary flow rate; PV, prostate volume; QOL, quality of life; PSA, prostate-specific antigen.

hyperplasia, such as BPH (28,29). Our results showed that dutasteride effectively improved Qmax in patients with BPH compared with finasteride [MD =0.32; 95% CI: (0.01, 0.63); P=0.04]. This suggests that dutasteride may be superior to finasteride in improving Qmax in BPH patients in clinical. BPH is also characterized by increased IPSS, PV, QOL and serum PSA levels. High levels of serum PSA promote the progression of prostatic hyperplasia. Previous results showed that, compared with placebo, both dutasteride and finasteride reduced IPSS and QOL and increased PV and serum PSA levels (30,31). There was no significant difference in ADRs between the dutasteride and finasteride groups in our analysis. However, it has been reported that long-term treatment with dutasteride leads to erectile dysfunction, decreased testosterone levels, increased glucose and glycosylated hemoglobin, and changes in the blood lipid profile, suggesting metabolic imbalance and decreased gonadal function (32). Therefore,

it is advisable to explain the potential serious side effects of long-term dutasteride therapy to patients prior to initiation of dutasteride therapy.

To a certain degree, there are some limitations and shortcomings in this study. First, there are differences in patient selection and experimental design among studies, resulting in greater heterogeneity in some indicators. Second, the follow-up term of each study was different. Some studies even had no long-term follow-up data. Thus, the long-term efficacy cannot be analyzed. Finally, the articles included were mainly English, which may affect selection bias.

In conclusion, dutasteride is an effective and safe treatment for BPH, with a better effect on improving Qmax than finasteride. Due to the limitations of the methodological quality and sample size of the included studies, this conclusion needs to be verified by stratified RCTs with high volumes and long follow-up times.

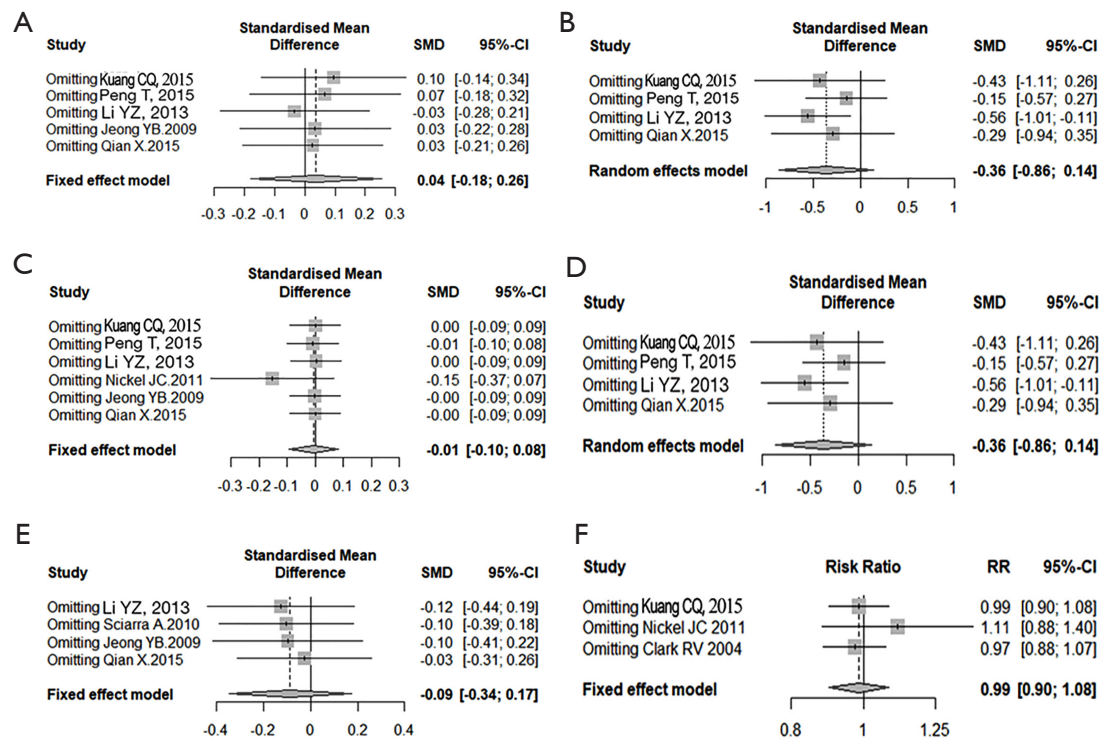


Figure 11 Sensitivity analysis of meta-analysis literature. (A) Sensitivity analysis of meta-analysis literature included IPSS. (B) Sensitivity analysis of meta-analysis literature included Qmax. (C) Sensitivity analysis of meta-analysis literature included PV. (D) Sensitivity analysis of meta-analysis literature included QOL. (E) Sensitivity analysis of meta-analysis literature included PSA. (F) Sensitivity analysis of meta-analysis literature included adverse events. SMD, standard mean difference; CI, confidence interval; IPSS, International Prostate Symptom Score; Qmax, maximum urinary flow rate; PV, prostate volume; QOL, quality of life; PSA, prostate-specific antigen.

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Footnote

Reporting Checklist: The authors have completed the PRISMA reporting checklist. Available at <https://tau.amegroups.com/article/view/10.21037/tau-22-58/rc>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://tau.amegroups.com/article/view/10.21037/tau-22-58/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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