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MISSION

Through worldwide collaboration, CROES seeks to assess, using evidence based scientific methodology, the various aspects of clinical endourology.

VISION

By applying rigorous scientific evaluation to the field of clinical endourology, CROES will enable all urologic surgeons to bring to their patients the most effective and efficient care possible.

PROJECTS

- Global PCNL study
- Global URS study
- Global GreenLight Laser study
- Global Renal Mass study
- Global NBI study

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THE CROES PERCUTANEOUS NEPHROLITHOTOMY GLOBAL STUDY: FINAL REPORT

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The Clinical Research Office of the Endourological Society (CROES), which aims to promote and support high quality international patient-centered research, has recently completed its first project, the CROES Percutaneous Nephrolithotomy (PCNL) Global Study, with great success. To briefly remind the readers, this study was conducted from November 2007 until December 2009, with participation of 96 centers from all around the world. Prospective data from nearly 6000 patients who were treated with PCNL were collected, analyzed, reviewed, and, finally, more than 25 articles have been published (some of them still under editorial review).^{1,2} In addition, numerous scientific presentations have been presented at international and national meetings. The study was finally closed at the 32nd World Congress of Endourology in 2012, hoping to conduct further prospective studies on PCNL, ureteroscopy, and shockwave lithotripsy.

This global study is not just highly important because of its scientific impact but it also stands out as an outstanding example to our Endourological Society with the organization in collecting, analyzing, and presenting the data. Taking the trends toward globalization of research, CROES has also successfully become an ideal partner of the global network in research. The Global PCNL study is unique not only in terms of sample size but also in standardization of data collection methods as well as data management and article preparation systems. Since then, CROES has embarked on four additional studies that we believe will add a lot to the literature.

In the era of everyday rapidly developing technology, the CROES Global PCNL Study stands out as very crucial to redefining the current role of PCNL in the management of kidney stones, which are today also being managed with other minimally invasive treatment alternatives such as retrograde intrarenal surgery and laparoscopy. Furthermore, long-term consequences of shockwave lithotripsy observed and published in the literature have resulted in this easy alternative to fall into disfavor in many centers.³ Therefore, indications, techniques used, complications, and results of PCNL in the management of renal stones were extensively reviewed in the CROES Global PCNL Study.

In the first article published from the CROES Global PCNL Study data, indications, complications, and outcomes in 5803 patients were assessed, concluding once more that PCNL was an effective and safe technique in the management of renal stones.⁴ Since its publication in 2011, this initial article has been cited 71 times in the literature (Google Scholar Search, October 2012). Thereafter, the CROES PCNL Study Group focused on challenging and debatable issues such as preoperative antibiotic prophylaxis, positioning, dilation and access techniques, stone fragmentation devices, and exit strategies as well as success rates and their predictors, complications, and results in special groups.

Two articles from the same database focused on tract dilation methods and compared different techniques.^{5,6} The study interestingly showed that the predominant method used was telescopic/serial dilation in Asia (94.7%) and South America (98.0%), and balloon dilation in North America (82.6%). Although rates of bleeding, blood transfusions, and drop in mean hematocrit level were found to be

higher in the balloon *vs* telescopic/serial dilator group,⁵ additional multivariate analysis revealed that Amplatz sheath size but not dilation method was predictive for bleeding.⁶

The CROES PCNL Global Study showed that 62% of patients undergoing PCNL were overweight or obese and that approximately one-third had significant comorbid illness, such as diabetes or cardiovascular disease, making preoperative evaluation more noteworthy.⁴ Furthermore, the study concluded that antibiotic prophylaxis of patients undergoing PCNL with a negative baseline urine culture was associated with a significant reduction in the rate of postoperative fever and other complications, thus supporting the existing guidelines of the American Urological Association and European Association of Urology.⁷

Another debatable point—positioning during PCNL—has also been questioned and analyzed using the database. The vast majority of patients undergoing PCNL were in a prone position during the procedure (80.3%), while the remaining were in a supine position; this fact showed that on a global scale, supine PCNL had not yet gained widespread use in the urologic community.⁸ The study concluded that, although operative time and stone-free rates favored prone PCNL, the choice of patient position should be tailored to individual patient characteristics and to the surgeon's preference.⁸

Percutaneous access was obtained using ultrasonographic guidance only in 13.7% of patients and fluoroscopic guidance only in 86.3%.⁹ Despite the fact that fluoroscopic-guided percutaneous access was found to be associated with a higher incidence of hemorrhage on univariate analysis, this finding was found to be related to a greater access sheath size ($\geq 27F$) and multiple punctures on multivariate analysis.⁹ The indications and outcome of isolated upper pole access has been evaluated in a recent article by the CROES PCNL Study Group.¹⁰ This study clearly showed that isolated upper pole access is indicated in a selected group of cases with complex stones. Upper caliceal and staghorn stones are more commonly managed with upper pole access, which is associated with a higher complication rate and longer hospital stay as well as lower stone-free rates, because of the complexity of the procedure.¹⁰

According to data of the Global PCNL study, fragmentation was performed using a pneumatic device (41.6%), ultrasonic device (24%), combined pneumatic and ultrasonic device (18.3%), laser (7.0%), electrohydraulic lithotripsy (1.0%), and no device in 8.1% of patients.⁴ The article about the relationship between lithotripter used and outcome is still in the editorial process.

Worldwide clinical practice with PCNL exit strategies and outcomes of the different strategies were also investigated in the CROES Global PCNL Study,¹¹ and it was shown that a nephrostomy tube was placed at the end of the procedure in 91.2% of cases.⁴ Results of this large cohort confirmed the advantages of tubeless PCNL procedures described in the literature, but the conclusion was that preoperative characteristics of the patients and clinical course of the surgery were the main drivers of complication rates when considering the type of exit strategy.¹¹ In addition, postoperative pain was less with small diameter tubes, although no differences were observed between groups in stone-free rates and the incidence of bleeding.¹²

The success of PCNL was defined as the patient being stone free by 30 days post-PCNL in the CROES Global PCNL Study, and the indications for secondary procedures were listed as the presence of significant remnant stones and obstructing residual fragments.⁴ In the cohort, 75.7% of patients were reported to be stone free, while 84.5% did not need any further treatment at the end of the first postoperative month.⁴ It is obvious, however, that longer follow-up studies are necessary to define the long-term success as well as stone recurrence. Predictors of success were analyzed in the cohort and the impact of case volume was also investigated. The stone-free rate increased with case volume, after adjusting for stone burden, urine culture status, American Society of Anesthesiologists score, and the presence of staghorn stones. Not surprisingly, the highest stone-free rates were observed in centers with >120 cases per year.¹³

The efficacy of imaging modality in predicting stone-free rates was also assessed in the cohort, and the article is still under peer review. Very recently, a nephrolithometric nomogram, based on stone and patient characteristics, for predicting treatment success in PCNL has been developed by Smith and associates (unpublished data, 2012), using the CROES Global PCNL Study database. These nomograms seem to be highly useful in informing patients about the success rates of the procedure.

Complications after PCNL and risk factors were investigated comprehensively in the CROES Global PCNL Study, with the most commonly reported complications being bleeding necessitating blood transfusion, postoperative fever, and urine leakage.¹⁴⁻¹⁶ In addition, complications reported were classified using the modified Clavien system, results were further validated, and a standard list of post-PCNL complications and their corresponding Clavien score was created.^{14,15} Multivariate regression analysis of selected patient and procedural characteristics in the cohort revealed that operative time and American Society of Anesthesiologists score were significant predictors of higher mean Clavien scores. These efforts are believed to allow comparison of data among different centers, among different therapies, and within a center over time.

The outcome of PCNL in special subgroups was analyzed in the CROES Global PCNL Study, and special technical considerations to augment success rates while diminishing complications were revisited. The outcome of PCNL in large numbers of patients ever reported with staghorn stones,¹⁸ single large nonstaghorn stones,¹⁸ renal anomalies,¹⁹ solitary kidneys,²⁰ chronic renal disease,²¹ as well as in children,²² elderly patients,²³ and obese/superobese patients^{24,25} was investigated comprehensively.

As a conclusion, the CROES Global PCNL Study data represent the largest series ever published. Most importantly, this database has enabled us to create a standard list of complications classified according to their severity and let us analyze outcome in special groups of patients. Furthermore, worldwide variations among technical applications were identified. There are still many questions left to be answered in future studies, however.

References

1. de la Rosette J, Gravas S. News from CROES: WCE 2010 and beyond. *J Endourol* 2010;24:1701-1704.
2. de la Rosette J, Gravas S, van Rees Vellinga S. Progress report on the CROES studies. *J Endourol* 2011;25:721-725.
3. Krambeck AE, Gettman MT, Rohlinger AL, et al. Diabetes mellitus and hypertension associated with shock wave lithotripsy of renal and proximal ureteral stones at 19 years of followup. *J Urol* 2006;175:1742-1747.
4. de la Rosette JJ, Assimos D, Desai M, et al. The Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study: Indications, complications, and outcomes in 5803 patients. *J Endourol* 2011;25:11-17.
5. Lopes T, Sangam K, Alken P, et al. The Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study: Tract dilation comparisons in 5537 patients. *J Endourol* 2011;25:755-762.
6. Yamaguchi A, Skolarikos A, Buchholz NP, et al. Operating times and bleeding complications in percutaneous nephrolithotomy: A comparison of tract dilation methods in 5,537 patients in the Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study. *J Endourol* 2011;25:933-939.
7. Gravas S, Montanari E, Geavlete P, et al. Postoperative infection rates in low risk patients undergoing percutaneous nephrolithotomy with and without antibiotic prophylaxis: A matched case control study. *J Urol* 2012;188:843-847.
8. Valdivia JG, Scarpa RM, Duvdevani M, et al. Supine versus prone position during percutaneous nephrolithotomy: A report from the clinical research office of the endourological society percutaneous nephrolithotomy global study. *J Endourol* 2011;25:1619-1625.
9. Andonian S, Scoffone C, Louie MK, et al. Does imaging modality used for percutaneous renal access make a difference? A matched case analysis. *J Endourol* 2012 Jul 26. Epub ahead of print.
10. Tefekli A, Esen T, Olbert P, et al. Isolated upper pole access in percutaneous nephrolithotomy: A large scaled analysis from the CROES Percutaneous Nephrolithotomy Global Study. *J Urol*. In press.
11. Cormio L, Gonzalez GI, Tolley D, et al. Exit strategies following percutaneous nephrolithotomy (PCNL): A comparison of surgical outcomes in the Clinical Research Office of the Endourological Society (CROES) PCNL Global Study. *World J Urol* 2012 Jul 1. Epub ahead of print.
12. Cormio L, Preminger G, Saussine C, et al. Nephrostomy in percutaneous nephrolithotomy (PCNL): Does nephrostomy tube size matter? Results from the Global PCNL Study from the clinical Research Office of the Endourology Society. *World J Urol*. 2012 Oct. 17. Epub ahead of print.
13. Opondo D, Tefekli A, Esen T, et al. Impact of case volumes on the outcomes of percutaneous nephrolithotomy. *Eur Urol*. 2012 Mar 16. Epub ahead of print.
14. Labate G, Modi P, Timoney A, et al. The percutaneous nephrolithotomy global study: Classification of complications. *J Endourol* 2011;25(8):1275-1280.
15. de la Rosette JJ, Opondo D, Daels FP, et al. Categorisation of complications and validation of the Clavien score for percutaneous nephrolithotomy. *Eur Urol* 2012;62:246-255.
16. Gutierrez J, Smith A, Geavlete P, et al. Urinary tract infections and post-operative fever in percutaneous nephrolithotomy. *World J Urol* 2012 Feb 25. Epub ahead of print.
17. Desai M, De Lisa A, Turna B, et al. The clinical research office of the endourological society percutaneous nephrolithotomy global study: Staghorn versus nonstaghorn stones. *J Endourol* 2011;25:1263-1268.
18. Xue W, Pacik D, Boellaard W, et al. Management of single large nonstaghorn renal stones in the CROES PCNL global study. *J Urol* 2012;187:1293-1297.

19. Osther PJ, Razvi H, Liatsikos E, et al. Percutaneous nephrolithotomy among patients with renal anomalies: Patient characteristics and outcomes; a subgroup analysis of the clinical research office of the endourological society global percutaneous nephrolithotomy study. *J Endourol* 2011;25:1627–1632.
20. Bucuras V, Gopalakrishnam G, Wolf JS Jr, et al. The Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study: Nephrolithotomy in 189 patients with solitary kidneys. *J Endourol* 2012;26:336–341.
21. Sairam K, Scoffone CM, Alken P, et al. Percutaneous nephrolithotomy and chronic kidney disease: Results from the CROES PCNL Global Study. *J Urol* 2012;188:1195–1200.
22. Guven S, Frattini A, Onal B, et al. Percutaneous nephrolithotomy in children in different age groups: Data from the Clinical Research Office of the Endourological Society (CROES) Percutaneous Nephrolithotomy Global Study. *BJU Int.* 2012 May 11. Epub ahead of print.
23. Okeke Z, Smith AD, Labate G, et al. Prospective comparison of outcomes of percutaneous nephrolithotomy in elderly patients versus younger patients. *J Endourol* 2012;26:996–1001.
24. Fuller A, Razvi H, Denstedt JD, et al. The CROES percutaneous nephrolithotomy global study: The influence of body mass index on outcome. *J Urol* 2012;188:138–144.
25. Fuller A, Razvi H, Denstedt JD, et al. The CROES percutaneous nephrolithotomy global study: Outcomes in the super-obese: A case control analysis. *CUAJ*. In press.

- The Global PCNL observational study was closed in December 2009.
- The Global Ureteroscopy study and the Global Renal Mass Study were closed for in January 2012. Data collection is still ongoing in a selected number of centres.
- The Global Greenlight Laser study was closed in April 2012.
- Ongoing project: The randomized study on Narrow Band Imaging *vs* White Light Imaging.
- For further information, please visit: www.croesoffice.org or contact the executive director of CROES, Mrs. Sonja van Rees Vellinga (info@croesoffice.org).