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The Kock pouch (continent ileostomy)

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Abstract

The Kock pouch (KP) or continent ileostomy (CI), a groundbreaking ileostomy technique with a reservoir, was introduced in 1969 by Nils Kock. This innovation aimed to enhance the quality of life of patients undergoing proctocolectomy with an end ileostomy, marking a significant stride forward before the advent of restorative surgery. The KP's initial popularity, however, was inversely proportional to the surgical expertise available, and its application across various conditions, including Crohn's disease and familial adenomatous polyposis (FAP), led to high complication rates by the late 1970s. These complications often involved valve slippage and high rates of valve and pouch excision. Following the introduction of ileoanal pouch anastomosis (IPAA) by Parks and Nicholls in the 1980s, use of the KP declined. However, with the advent of modern surgical technologies, notably advanced staplers, the KP has evolved significantly. The S-shaped KP, characterized by its improved postoperative results and facilitating easier endoscopic evaluations, represents this technological evolution. This article details the step-by-step procedure for creating the S-shaped KP, underscoring its advantages in surgical practice. Recently, the KP has regained significance in light of the high long-term failure rates of IPAA. For younger patients with a terminal ileostomy, the KP is recognized as a viable option for improving quality of life. Its indications extend to both primary and salvage procedures for patients unsuitable for IPAA or those with failed pelvic pouches. Preoperative considerations such as obesity, which complicates the construction and management of the reservoir, and strategic selection of the ostomy outlet site for patient comfort are integral to the process.

Keywords

IPAA failure · Secondary IPAA · Proctocolectomy, restorative · Familial adenomatous polyposis · Inflammatory bowel disease

Video Online

The online version of this article contains two videos. The article and the videos are available at <https://doi.org/10.1007/s00053-023-00765-7>. The videos can be found in the article back matter as “Electronic Supplementary Material.”



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Introduction

The Kock pouch (KP) or continent ileostomy (CI), first ingeniously described by Nils Kock in 1969 [1], represented a monumental advancement in ileostomy techniques, primarily aiming to improve the quality of life of patients after proctocolectomy by mitigating the continuous fecal flow associated with end ileostomies. This innovative concept, predating the era of restorative surgery, initially garnered significant interest. However, its adoption was inversely proportional to the level of available surgical expertise and the KP was broadly

applied to patients with various conditions, including Crohn's disease or familial adenomatous polyposis (FAP), leading to high complication rates by the end of the 1970s [2, 3].

Early ostomy and history of the Kock pouch

The first ileostomies, dating back to the late 19th and early 20th centuries, were designed for patients with obstructive lesions of the ascending colon [4]. Over time, these techniques evolved, addressing complications like skin injuries and

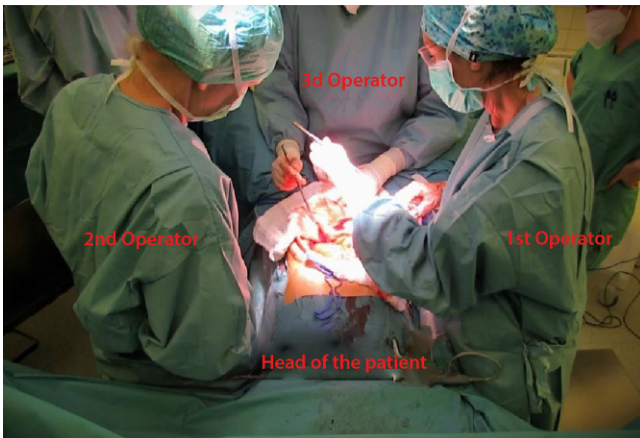


Fig. 1 ◀ Lloyd–Davies position, with abducted legs supported by leg stirrups

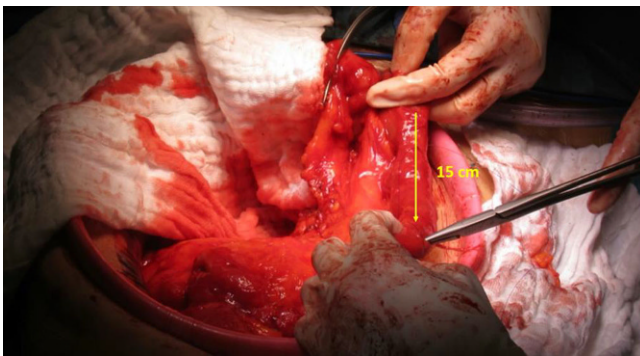


Fig. 2 ◀ Marking sutures at 15-cm intervals along the small intestine segment

medical issues such as renal insufficiency and dehydration [5]. Major improvements in ostomy care, including surgical maturation and new covering devices utilizing Karaya gum, emerged in the 1960s [6]. These advancements culminated in the KP, characterized by an antiperistaltic reservoir using the last 40 cm of the terminal ileum and an intussusception valve for complete fecal continence [1].

Technological evolution and current practices

Technological advancements, especially modern staplers, have refined the KP since its first description, addressing early surgical complications. Today, the S-shaped KP, known for improved postoperative results and easier endoscopic evaluation of the afferent loop, is increasingly favored [7, 8]. Despite the introduction of ileoanal pouch anastomosis (IPAA) in the 1980s by Parks and Nicholls [9], which initially overshadowed KP, the procedure has regained importance due to the high long-term failure rate of IPAA. For younger patients with a terminal ileostomy, CI is now

considered a viable option for enhancing quality of life.

Advancements in continent ileostomy techniques

Efforts to improve CI have led to several variations of the original KP technique, with the aim of achieving better outcomes for patients unsuitable for IPAA or with pouch failure. These innovations included valve stabilization with staplers, mesh reinforcements for the valve mechanism, and the introduction of isoperistaltic and T-pouch valves [7, 10]. However, these developments faced challenges, such as an increased fistula rate with non-resorbable meshes. The American S-shaped CI by Fazio, characterized by anchoring sutures of the pouch's posterior wall to the posterior rectus sheath, has been implemented in recent decades, showing improved postoperative outcomes and easier endoscopic access to the afferent loop [7, 8]. Ecker's recent data based on this technique reported low nipple valve complication rates over time, with a pouch failure rate of 14.7% in

a long-term series with an average follow-up of 11.5 years [11].

Therefore, the KP and its subsequent iterations have significantly evolved ostomy care, addressing both physical and quality of life concerns for patients requiring proctocolectomy. Despite facing challenges and shifts in surgical preferences, the KP and its modern adaptations continue to offer a valuable option for selected patients.

Indications and preoperative considerations

The recent revelation of a high IPAA failure rate of 19.4% after a median 15-year follow-up and a 30-year cumulative incidence rate of 31.7% [12], coupled with improved outcomes reported by experienced centers, necessitates a selective reevaluation of CI. Current indications have evolved to encompass CI as both a primary and a salvage procedure for patients contraindicated for IPAA or with failed pelvic pouches [13, 14], or those requiring a terminal ileostomy for various reasons. Additionally, emerging indications include neoplasia in the rectal remnant, notably for FAP, deteriorating pouch function, high stool frequency, and incontinence, particularly in older females, underscoring the pursuit of enhanced quality of life in patients undergoing multiple surgeries over their lifetime.

Obesity represents a relative contraindication, as it complicates both the technical aspects of continent ostomy construction and postoperative pouch management. In such cases, preoperative nutritional intervention may be beneficial, barring urgent oncological indications or the inability to delay surgery.

Another critical preoperative factor is selection of the future ostomy outlet site, which necessitates careful deliberation between the surgeon and patient, considering the patient's daily habits, such as the height of typically worn trousers. The preferred outlet location is generally in the "bikini" area, offering greater comfort and cosmetic appeal. Additionally, this location facilitates an evacuation directly into the toilet via the inserted catheter.

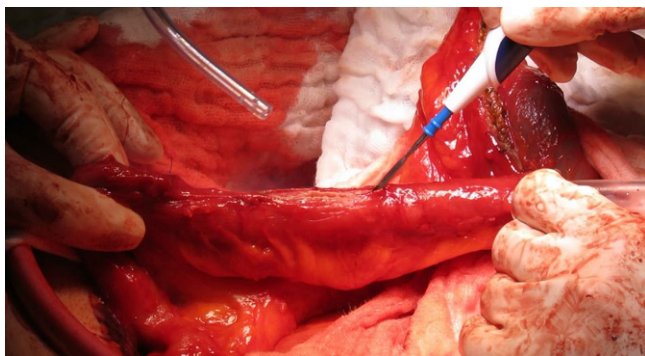


Fig. 3 ▲ Antimesenteric incisions; a rectal probe is employed within the bowel lumen

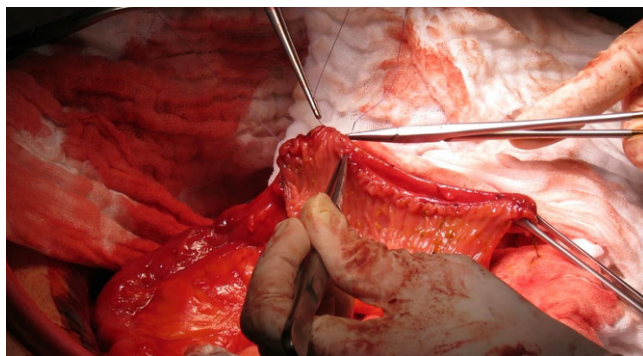


Fig. 4 ▲ Full-thickness suture of the posterior wall of the pouch

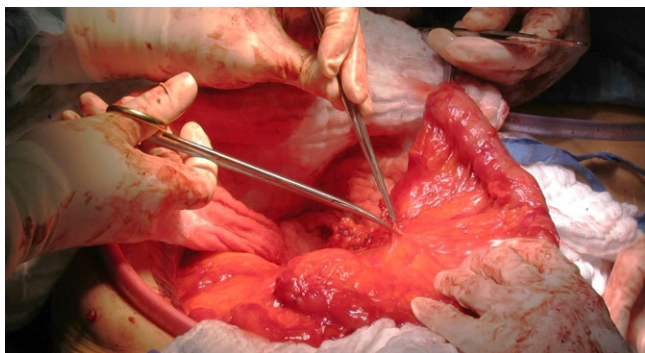


Fig. 5 ▲ The visceral peritoneum of the valve mesentery is excised in a triangular fashion

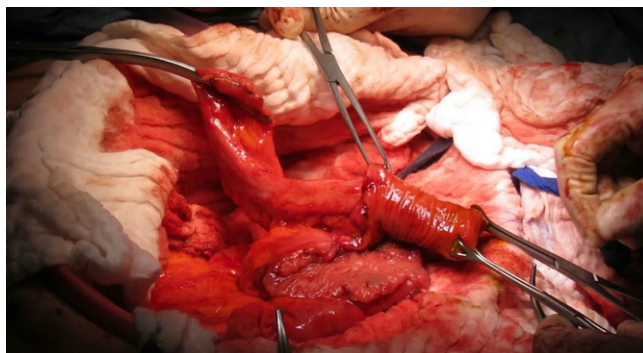


Fig. 6 ▲ Intussusception of the efferent limb into the developing reservoir



Fig. 7 ◀ Cautious removal of the blade from the linear cutter

Procedure

The patient is positioned on the operating table in a lithotomy position. In cases where the patient is undergoing resection of a previous ileoanal pouch, the legs should be abducted and supported by leg stirrups to provide access to the anorectal plane (Lloyd–Davies position, ■ Fig. 1).

Step 1. Bowel measurement and incision for pouch creation. The initial stage involves precise measurement of the small intestine segment required to construct

the pouch, typically 60 cm in length. Distinct marking sutures are placed at 15-cm intervals along this segment (■ Fig. 2). Subsequently, a longitudinal antimesenteric incision is performed on the bowel, sparing the proximal 15-cm segment. This intact portion is preserved for the subsequent construction of the valve and outlet mechanism of the pouch.

Step 2. Repetition of measurements and S-shaped pouch formation. This step involves repetition of the 60-cm small bowel measurement four times, integral to forma-

tion of the S-shaped continent ileostomy (CI). At our center, we prefer this method due to its enhanced postoperative outcomes and the facilitation of endoscopic evaluation of the afferent loop. For creating precise antimesenteric incisions, it is often beneficial to employ suction or a rectal probe within the bowel lumen, ensuring the straightness and accuracy of these incisions (■ Fig. 3). This careful technique is crucial for successful formation of the S-shaped structure of the pouch.

Step 3. In the subsequent stage of the procedure, we meticulously suture the posterior wall of the pouch, addressing each limb sequentially (■ Fig. 4). This critical step is executed using dual continuous full-thickness sutures composed of absorbable material, typically Polydioxanone (PDS; Johnson & Johnson, New Brunswick, NJ, USA). This technique effectively unites the three loops of the bowel, ensuring a robust and secure construction of the pouch's posterior aspect.

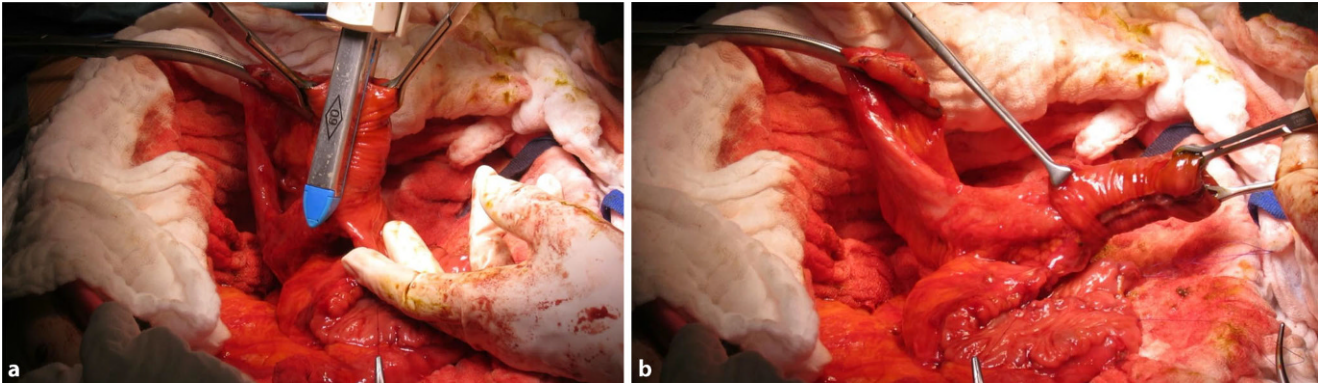


Fig. 8 ▲ **a** Fixation of the bowel for the nipple valve using the 60-mm linear cutter and avoiding the mesentery. **b** Final macroscopic result after application of the knifeless linear cutter

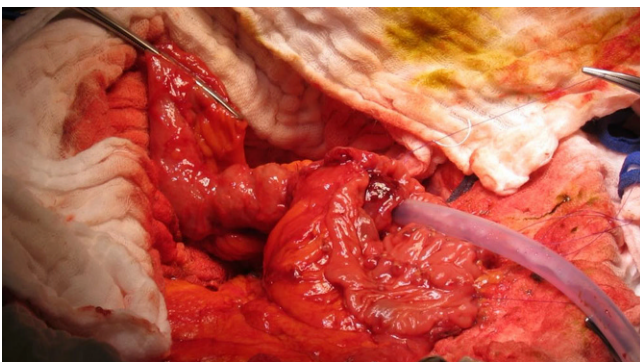


Fig. 9 ▲ Full-thickness suture of the anterior wall of the pouch

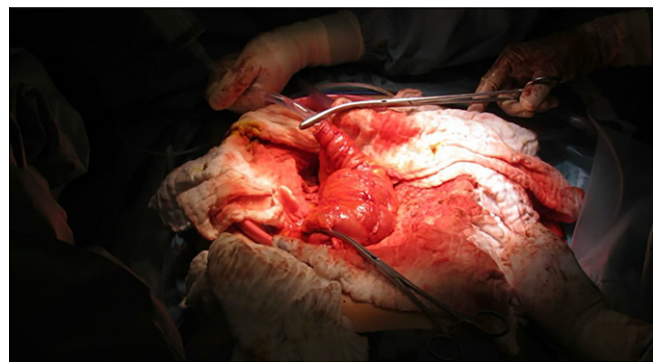


Fig. 10 ▲ Continence test of the newly fashioned reservoir

Step 4. At this juncture, with particular emphasis on patients with a higher body mass index, the peritoneal layer covering the valve's mesentery is meticulously excised in a triangular fashion on both sides (■ Fig. 5). This step is critical for ensuring optimal surgical outcomes in these patients.

Step 5. The nipple valve is meticulously constructed by intussuscepting the efferent limb into the developing reservoir (■ Fig. 6, Video 1). This is achieved using two to three Babcock clamps, which facilitate precise manipulation and alignment during the intussusception process.

Exercising meticulous care to avoid the mesentery, we employ a 60-mm knifeless linear cutter (■ Fig. 7) to secure the nipple valve, which measures approximately 4–5 cm in length. This process involves three precise applications of the cutter, ensuring durable and stable fixation of the bowel for the nipple valve (■ Fig. 8a,b).

Following the valve's construction, the final phase of pouch assembly involves

the closure of its anterior wall. This critical step is executed using a continuous full-thickness absorbable suture (■ Fig. 9). Prior to finalizing the suture, an additional step is undertaken to secure the valve to the anterior wall of the pouch. In recent procedures, we have consistently utilized the closing suture line for this purpose. Subsequently, a seromuscular oversewing technique is meticulously performed to reinforce the structural integrity of the pouch.

At this stage, an assessment of continence is conducted (■ Fig. 10). This involves the introduction of a catheter through the nipple valve into the pouch, followed by cautious instillation of physiological saline solution. Subsequently, while maintaining the catheter in a clamped state, it is extracted to evaluate for complete continence (Video 2). In instances of any leakage, the affected areas must be meticulously oversewn to secure full continence of the reservoir. After this corrective step, the catheter is reinserted

for the purpose of evacuating the instilled fluid.

Following preparation of the stoma opening, attention is directed towards meticulous preparation of the outlet. A critical step involves securely affixing the collar of the pouch to the abdominal wall using non-absorbable sutures, specifically Prolene (Ethicon, Inc., Johnson & Johnson; ■ Fig. 11). These sutures are strategically positioned between the collar of the pouch, in proximity to the mesentery, and the posterior sheath of the rectus muscle. Once all sutures have been precisely placed, they are individually tied. Subsequent to this procedure, a second continence evaluation is performed.

In the final stage of the procedure, an intraabdominal drainage is placed and the catheter is repositioned in the pouch. After final closure of the abdominal wall, the catheter is secured to the skin with three braided absorbable stitches; these will be removed in the early postoperative days (■ Fig. 12).

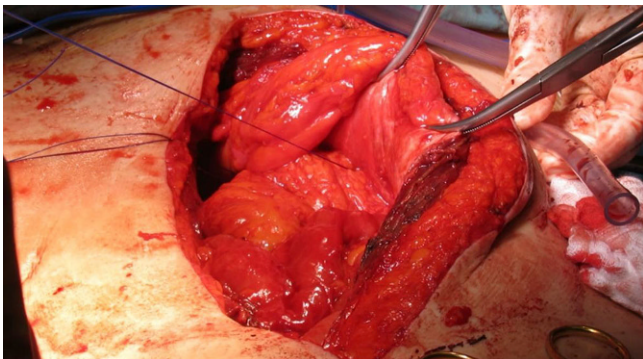


Fig. 11 ◀ The pouch's collar is secured to the posterior sheath of the rectus muscle using a Prolene (Ethicon, Inc., Johnson & Johnson, New Brunswick, NJ, USA) suture



Fig. 12 ▲ The abdominal wall at the end of the procedure

Discussion

When considering surgical options for patients with failed pouches, it is critical to weigh the implications of losing the pouch and part of the small bowel for an ileostomy against the benefits of retaining the pouch and augmenting the reservoir to fashion a continent ileostomy. This decision is particularly consequential due to the existential significance of preserving small bowel length in these patients.

Retaining the pouch and opting for a continent ileostomy, where feasible, can offer several advantages. This approach preserves more of the small intestine, which is crucial for nutrient absorption and overall intestinal health. Preservation of small bowel length is essential, especially for patients who have already undergone multiple surgeries or have limited bowel length due to disease or previous resections. A continent ileostomy, by creating an internal reservoir with a valve mechanism for controlled evacuation, can potentially offer better quality of life compared to a traditional ileostomy, as it avoids the constant wear of an external appliance and provides more control over bowel movements.

Benefits of redo-pouches

- *Preservation of natural bowel function:* Redo-surgery aims to maintain natural bowel function and avoid life-long dependence on an ostomy bag. This preservation can be significant for the patient's psychological wellbeing and self-image.
- *Improved quality of life:* For some patients, redo-surgery can lead to a better quality of life when successful,

allowing for more normal bowel function and social activities.

- *Possibility of reversal:* In some cases, redo-surgery offers the possibility of reversing a failed initial surgery, providing a second chance at improved bowel function and comfort.
- *Technological and surgical advances:* With advancements in surgical techniques and technology, the success rates of redo-surgeries have improved, offering a viable option for many patients.

On the other hand, removing the pouch for a permanent ileostomy often results in the loss of additional small bowel. This loss can have significant long-term consequences, including risks of short bowel syndrome, malabsorption, and nutritional deficiencies. These risks underscore the importance of considering every possible option to preserve as much small bowel as possible.

Benefits of terminal ileostomy

- *Reduced surgical risk:* Opting for a terminal ileostomy may be less risky compared to undergoing complex redo-surgeries, especially in patients with multiple comorbidities or those who have undergone multiple abdominal surgeries.
- *Stable and predictable outcome:* A terminal ileostomy provides a more predictable and stable outcome in terms of bowel management, reducing the uncertainty associated with redo-surgeries.
- *Avoidance of repeated interventions:* By choosing a terminal ileostomy, patients can avoid the need for poten-

tially multiple redo-surgeries and the associated risks and recovery periods.

- *Simpler postoperative care:* The care and management of a terminal ileostomy, though life-changing, can be simpler compared to managing the potential complications and demands of a redo-surgery.

The choice between redo-surgery and a terminal ileostomy is highly individual and should be made after a thorough discussion between the patient and the surgical team. It is crucial to consider the patient's lifestyle, their ability to manage a stoma, the severity of symptoms from the failed pouch, and their overall medical condition. Patient education and counseling play a key role in helping them make an informed decision that aligns with their health goals and quality of life.

Benefits of the Kock pouch

- *Continence control:* The Kock pouch offers the advantage of continence control, allowing patients to empty the pouch at their convenience. This feature can significantly enhance the patient's autonomy and lifestyle flexibility.
- *Cosmetic and psychological benefits:* With a more discreet stoma that can be concealed with a small dressing, the Kock pouch offers better cosmetic outcomes. This aspect can positively impact the patient's self-image and social confidence.

- Reduced dependence on external appliances: Unlike a permanent ileostomy, which requires an external appliance for waste collection, the Kock pouch eliminates this need, offering a sense of normalcy and reducing the psychological burden associated with visible ostomy appliances.

Quality of life

Quality of life considerations are paramount in these decisions. While a permanent ileostomy might offer stability and predictability in bowel function, the benefits of retaining the pouch and small bowel cannot be overstated, particularly in terms of the patient's nutritional status and overall health. This is especially crucial for patients who might face the risk of short bowel syndrome or other complications from further small bowel loss. The unanswered question remains of whether a redo-pouch or rather a Kock pouch is more suitable for an individual patient with IPAA failure and an in situ pouch. For this decision-making, a recent paper describing the pros and cons may be helpful [15]. Many patients report a higher quality of life with a Kock pouch due to the control it offers and the reduced impact on daily living and activities, including sleep quality.

Conclusion

In conclusion, the decision between performing a redo-pouch or sacrificing the pouch for an ileostomy or retaining it for a continent ileostomy should be made with a deep understanding of the long-term implications of small bowel preservation. It is vital to counsel patients thoroughly about the potential outcomes and lifestyle implications of each option. Raising awareness about the importance of preserving small bowel length in these surgical decisions is essential for ensuring optimal long-term outcomes for the patients.

Kock-Pouch (kontinente Ileostomie)

Der Kock-Pouch (KP) oder die kontinente Ileostomie, eine bahnbrechende Ileostomietechnik mit einem Reservoir, wurde 1969 von Nils Kock eingeführt. Ziel dieser Innovation war, die Lebensqualität von Patienten zu erhöhen, bei denen eine Proktokolektomie mit endständiger Ileostomie erfolgte, was einen bedeutenden Fortschritt darstellte, bevor die restaurative Chirurgie aufkam. Die anfängliche Popularität des KP war jedoch umgekehrt proportional zur verfügbaren chirurgischen Expertise, und seine Anwendung bei verschiedenen Erkrankungen, einschließlich M. Crohn und familiärer adenomatöser Polyposis, führte zu hohen Komplikationsraten in den späten 1970er-Jahren. Zu den Komplikationen gehörten häufig eine Klappendislokation und hohe Raten an Klappen- und Pouchexzisionen. Nach Einführung der ileoanalen Pouchanastomose (IPAA) durch Parks und Nicholls in den 1980er-Jahren nahm der Einsatz des KP ab. Allerdings hat sich mit dem Aufkommen moderner chirurgischer Technologien, v.a. hochentwickelter Klammergeräte, der KP erheblich weiterentwickelt. Der S-förmige KP, der sich durch bessere postoperative Ergebnisse und die Erleichterung endoskopischer Beurteilungen auszeichnet, steht für diese technische Entwicklung. Der vorliegende Beitrag stellt das Schritt-für-Schritt-Verfahren zur Anlage des S-förmigen KP dar und unterstreicht dessen praktische chirurgische Vorteile. Aktuell hat der KP wieder an Bedeutung gewonnen – angesichts der hohen Langzeitmisserfolgsraten der IPAA. Für jüngere Patienten mit einem terminalen Ileostoma ist der KP als praktikable Option zur Verbesserung der Lebensqualität anerkannt. Die Indikation dafür reicht sowohl bis zu primären als auch Salvage-Eingriffen bei Patienten, die für die IPAA ungeeignet sind, oder bei Versagen des Pouches im Beckenbereich. Integraler Bestandteil des Ablaufs sind präoperative Abwägungen, z. B. bei Adipositas, welche die Anlage und Versorgung des Reservoirs erschwert, und die strategische Auswahl der Auslassstelle des Stomas in Bezug auf das Wohlbefinden der Patienten.

Schlüsselwörter

Pouch-Versagen · Sekundäre Pouchanlage · Proktokolektomie, restaurative · Familiäre adenomatöse Polyposis · Entzündliche Darmerkrankungen

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Declarations

Conflict of interest. G. Colletti, K.-W. Ecker, and G. Möslein declare that they have no competing interests.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Additional informed consent was obtained from all individual participants from whom identifying information is included in this article.

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Friederike v. Gierke, Gudula Keller, Nikolaus Mezger

Die grüne Arztpraxis

Gesundheit, Nachhaltigkeit und Mitgestaltung der ökologischen Wende

Medizinisch Wissenschaftliche Verlagsgesellschaft 2024, 1. Auflage, 250 Seiten S., 21 S/W Abbildungen Abb., 9 Tabellen Tab., (ISBN: 978-3-95466-867-0), Paperback 49,95 EUR

Das kürzlich erschienene Fachbuch „Die Grüne Arztpraxis“ rundet neben „Green Hospital“ und „Planetary Health“ die Reihe Green Health des MWV ab. Es richtet sich besonders an Leitungspersonal und Nachhaltigkeitsbeauftragte in Arztpraxen, MVZ und anderen ambulanten Gesundheitseinrichtungen, aber auch an Mitarbeitende in Politik und Selbstverwaltung.

Den Herausgebenden ist es gelungen, neben namhafter Expertise und wissenschaftlicher Forschung auch Kolleginnen und Kollegen mit praktischer Erfahrung aus der Niederlassung für Beiträge zu gewinnen. Durch vielfältige Exkurse und konkrete Praxisberichte ergeben sich eine spannende Übersicht zum Thema und viele Ideen zur Umsetzung für die eigene Arbeit.

Nach einem Grundlagenteil mit der Einordnung medizinischen Handelns in den Kontext von Klima und Gesundheit sowie einer Einführung in das Konzept von Planetary Health legt das Buch den Fokus besonders auf drei Schwerpunkte. Dabei hilft die klimasensible Gesundheitsberatung, klimaassoziierte Themen im täglichen Patientengespräch zu integrieren. Sie zeigt Optionen für Behandlung und Prävention von Erkrankungen auf, die durch die Klimaveränderungen verstärkt auftreten. Das Kapitel klimagesunde Praxisführung stellt viele effektive Maßnahmen zur Einsparung von CO₂ und Kosten sowie zum ressourcenschonenden Umgang mit Materialien und medizinischen Maßnahmen vor. Besonders hervorzuheben ist hier der umfassend aufgearbeitete Abschnitt zur Arzneimitteltherapie sowie den Möglichkeiten, der Umweltbelastung durch Pharmaka entgegenzuwirken, ein Aspekt, der in der täglichen ärztlichen Arbeit bisher kaum Berücksichtigung findet. Die resiliente Praxisgestaltung hingegen macht die eigene Praxis fit für die Herausforderungen der Klimakrise und sei jedem Inhaber ans Herz gelegt.

Das Buch eignet sich hervorragend zur Neu-

ausrichtung der eigenen Praxis, als Geschenk zur Praxiseröffnung oder für Geschäftspartner im ambulanten Gesundheitsbereich.

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