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Review Article

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Importance of Abdominal Wall Strengthening Exercises in the Prevention of Parastomal Hernia

Hamdiye Banu Katran [1], Nurgül Arpag [2] & Sevgi Gür [3]

[1] Marmara University Faculty of Health Sciences, Department of Nursing, Surgical Diseases and Nursing, Istanbul, Türkiye
[2] Istanbul Atlas University, Faculty of Health Sciences, Department of Nursing, Istanbul, Türkiye
[3] Selcuk University, Faculty of Nursing, Department of Surgical Diseases and Nursing, Konya, Türkiye

Abstract This review investigates the significance of abdominal wall strengthening exercises in preventing the development of parastomal hernia. Parastomal hernia is a common complication following stoma creation and can negatively impact patients' quality of life. Studies suggest that exercises strengthening the abdominal muscles may reduce the risk of parastomal hernia. Particularly, such exercises implemented after surgical interventions are emphasised to play a preventive role by balancing intra-abdominal pressure and stabilising the abdominal wall, thereby hindering hernia formation. It is stated that regular and proper performance of exercises enhances their protective effects against parastomal hernia. In this context, it is of utmost importance for healthcare professionals to inform and guide patients regarding this matter.

Keywords Abdominal wall exercises · hernia prevention · parastomal hernia · stoma complications

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Corresponding author: Hamdiye Banu Katran banu-katran@hotmail.com

INTRODUCTION

Parastomal hernia is one of the most common complications following stoma surgery and can significantly impair the quality of life (1). It occurs when intra-abdominal organs protrude through the abdominal wall at the site of the stoma, commonly formed through colostomy, ileostomy, or urostomy procedures (1,2). Patients may experience pain, swelling, and occasionally bowel obstruction, leading to impaired stoma function and reduced surgical outcomes (1). The pathophysiology of parastomal hernia is multifactorial and involves anatomical, surgical, and patient-related risk factors (2).

Given the clinical significance of this condition, this review aims to highlight the role of abdominal wall strengthening exercises in the prevention of parastomal hernia, supported by current scientific evidence.

Incidence and Causes of Parastomal Hernia

The incidence of parastomal hernia varies between 5.8% and 40% in studies (3,4). In addition, although the incidence of parastomal hernia varies depending on the follow-up period, it is estimated to be over 30% in patients followed for 12 months, 40% in patients followed for 2 years, and 50% or more in patients followed for longer periods (5-7).

The development of a parastomal hernia is associated with the weakening of the abdominal wall. When the natural anatomical barriers in the abdominal wall are cut during stoma creation, a favourable environment for hernia formation is provided in this region (8). Hernia may worsen with increased intra-abdominal pressure and weakened musculature. The main factors affecting this process are;

Surgical Trauma and Abdominal Wall Weakness: When opening a stoma, it is imperative to create a permanent opening in the abdominal wall. This opening can disrupt normal anatomical barriers and allow intra-abdominal organs to protrude. When the abdominal wall is weakened, the intestines or other intra-abdominal structures may herniate and protrude through this opening (9). In addition, the surgical technique and the site of stoma placement are also important factors affecting the risk of hernia (1).

Intra-abdominal Pressure: Intra-abdominal pressure also plays an important role in the development of parastomal hernia. High intra-abdominal pressure exerts a force outward from a weak point in the abdominal wall, which can trigger hernia formation (10). Factors that cause increased intra-abdominal pressure include obesity, heavy lifting, chronic cough, constipation, and weak abdominal muscles, which also affect hernia formation (1).

Risk Factors in Parastomal Hernia

Risk factors for parastomal hernia formation include surgical techniques, age, gender, body mass index (BMI), lack of physical activity, and other lifestyle factors (11-18).

Surgical Techniques: Surgical techniques play a critical role in the development of parastomal hernia (PH), as improper stoma placement or inadequate suturing can compromise the integrity of the abdominal wall and facilitate herniation. While laparoscopic approaches are generally considered minimally invasive, some studies that they may be associated with a higher PH risk compared with open techniques, particularly due to challenges in accurate stoma positioning (11,12). For instance, the transperitoneal route has been linked to a greater incidence of PH than the extraperitoneal approach in patients undergoing abdominoperineal resection (13). Conversely, laparoscopic repair techniques may offer advantages in terms of lower recurrence and fewer postoperative complications when performed with precision (14). A recent meta-analysis also emphasised that the technical execution of stoma relocation or reinforcement procedures and the surgeon's experience are key determinants of surgical outcomes (15). These findings collectively highlight the need for meticulous surgical planning and individualised technique selection to minimise the risk of PH.

Sociodemographic Characteristics: Demographic factors also play an important role in the development of parastomal hernia. As age increases, the risk of hernia increases due to the weakening of the abdominal wall muscles and decreased tissue elasticity. The incidence of parastomal hernia is higher in elderly patients (16). In terms of gender, the genetic structure of the abdominal wall muscles in women and the weakness of this region due to pregnancies may increase the risk of hernia. In addition, high BMI is also a critical factor in hernia development. Obesity causes increased intra-abdominal pressure, creating extra stress on the abdominal wall, which facilitates hernia development (17).

Lack of Physical Activity and Other Lifestyle Factors: Lack of physical activity increases the risk of parastomal hernia development due to muscle weakness and insufficient support of the abdominal wall, whereas regular exercise, especially activities that strengthen the abdominal muscles, can reduce the risk of hernia. However, sudden or excessive physical exertion is also considered a risk factor, as this can increase the intra-abdominal pressure and trigger hernia formation (17,18). Lifestyle factors such as smoking may also contribute to tissue weakness and hernia formation by impairing tissue oxygenation. In addition, poor eating habits

and inadequate musculature are other important factors that increase the risk of parastomal hernia formation (18).

Physiological Basis of Abdominal Wall Strengthening Exercises

In the physiologic basis of abdominal wall strengthening exercises, it is important to know the abdominal wall anatomy and muscle groups, the effect of exercise on abdominal wall muscles and the effect of exercise on intra-abdominal pressure (16,19).

Abdominal Anatomy and Muscle Groups: The abdominal wall anatomy consists of many tightly connected muscle groups and plays a critical role in the stability of the body. Muscle groups in the abdominal wall include the rectus abdominis, obliquus externus, obliquus internus, and transversus abdominis muscles. These muscles both protect the abdominal organs and help stabilise the spine. In addition, the abdominal wall muscles control the intra-abdominal pressure, helping to stabilise body weight and maintain the posture. Strong abdominal muscles act as a protective barrier against weaknesses in the abdominal wall, such as parastomal hernia (16).

Effects of Exercises on the Abdominal Muscles: Exercises that strengthen the abdominal muscles improve abdominal wall endurance by increasing muscle tone and play an important role in preventing hernia development. Activities such as core exercises and pilates regulate intra-abdominal pressure by targeting the transversus abdominis and obliquus muscles and increase the strength of the abdominal wall muscles (16,17). Studies show that regular exercises create resistance to abdominal wall weakness and reduce the development of hernia around the stoma. These exercises also contribute to the quality of life by increasing muscle control in patients with hernia (16,19,20).

Intra-abdominal Pressure and Hernia Development: Intra-abdominal pressure (IAB) refers to the pressure within the abdominal cavity and places a constant load on the abdominal wall. High IAB leads to weaknesses in the abdominal wall, increasing the risk of parastomal hernia formation. Increased IAB in overweight individuals or physical exertion such as heavy lifting may trigger hernia development (16,17). Exercises that strengthen the abdominal muscles help to keep the IAB under control and reduce the risk of hernia by increasing the endurance of the abdominal wall. Optimal IAB management is an important strategy to prevent hernia formation, especially in the stoma area (19,20).

Exercise Programs Used in the Treatment and Prevention of Parastomal Hernia

Clinical guidelines emphasise the need to educate patients about the importance of participating in abdominal wall strengthening and core exercises after surgery (16,17). Despite these recommendations, some studies have reported that approximately 90% of patients do not participate in any strengthening exercises. This gap in patient education highlights a critical area for improvement in postoperative care (21,22).

Core exercises are not only beneficial for increasing muscle strength but also contribute to better posture, body awareness and potentially faster recovery after surgery. These exercises can help reduce the risk of developing a parastomal hernia by strengthening the abdominal wall, which is crucial for supporting the stoma and preventing loops of the bowel from protruding through the abdominal wall (21).

Exercises used in the treatment and prevention of parastomal hernia are typically structured around programs that specifically target the abdominal muscles. Pilates, yoga, and core exercises play a crucial role in strengthening these muscles and managing intra-abdominal pressure (16). Pilates targets the core through controlled movements that strengthen the abdominal wall and improve posture. This may increase the integrity of the abdominal wall and help prevent hernia formation (18). Similarly, yoga promotes flexibility, body awareness, and endurance of the abdominal muscles. In particular, deep breathing and slow, controlled movements support the regulation of intra-abdominal pressure and muscle reinforcement without overloading the abdominal wall (23). Core exercises such as planks, bridges, and leg raises engage the transversus abdominis, rectus abdominis, and oblique muscles, enhancing abdominal coordination and reducing the risk of herniation (24). Examples of core exercises are illustrated in Figure 1 (These exercises should not be performed without professional guidance).

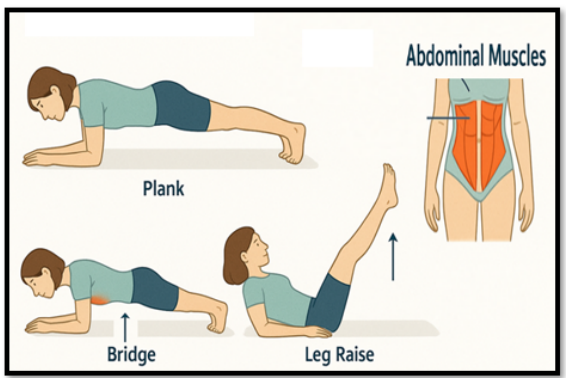

Figure 1. Core exercises for strengthening the abdominal muscles

The illustration was created using artificial intelligence–based image generation tools

Recent randomised controlled trials have explored the role of abdominal muscle-strengthening exercises in the prevention and management of parastomal hernia. For example, the Hernia Active Living Trial (HALT) investigated the impact of a Pilates-based intervention on the quality of life and abdominal control in individuals with a parastomal hernia or bulge. The findings showed improvements in core strength and reductions in hernia size (16-18). Another intervention project demonstrated that low physical activity levels increase the risk of parastomal hernia, whereas structured and regular core exercise programs can mitigate this risk (23).

The effectiveness of exercise programs depends heavily on their type and duration. Generally, these programs begin with mild to moderate intensity and gradually increase over time. In modalities like Pilates and yoga, sessions lasting 30–60 minutes and performed 2–3 times per week are widely recommended (16). Slow and controlled movements aimed at core stabilisation are emphasised. Personalisation of the program and a gradual increase in intensity are essential to minimise the risk of herniation. The structured planning of the warm-up, main exercise, and cool-down phases is also critical. For example, planks might begin with 30-second holds, progressively increasing each week. Performing exercises regularly and under professional supervision enhances both safety and effectiveness (25). Abdominal wall strengthening exercises should be performed under professional supervision. An example of a basic abdominal wall strengthening exercise is illustrated in Figure 2.

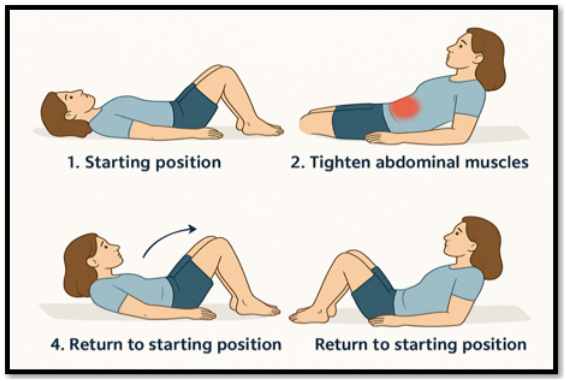

Figure 2. Steps for performing a basic abdominal wall exercise

(The illustration was created using artificial intelligence–based image generation tools).

Factors Determining the Effectiveness of Exercises

Exercise Adherence and Motivation: One of the most important factors determining the effectiveness of exercise is the adherence and motivation of the participant to the program. Exercise adherence refers to the capacity of the individual to maintain a regular exercise program. Especially in chronic conditions such as parastomal hernia, exercises need to be performed regularly to be effective in the long term. However, lack of motivation, challenges of daily life, or perception of exercise as challenging may negatively affect adherence (16,18). In the literature, it has been reported that guided individualised exercise programs increase motivation and higher rates of adherence (17). In addition, group activities or online exercise tracking systems may also positively affect adherence by increasing motivation.

Individualised Exercise Planning: In cases such as parastomal hernia, it is of great importance to plan exercises according to individual characteristics. Exercise programmes designed for individuals and considering factors such as age, gender, body mass index, general health and physical capacity may be more effective in reducing the risk of developing a hernia. For example, loss of muscle strength and flexibility is more common in older individuals; therefore, exercises should be planned to be low intensity and slow paced (16). In addition, more emphasis should be placed on exercises to control intra-abdominal pressure in obese individuals. Exercises tailored to the needs of each individual provide safer and more effective results (16,18).

Safety of Exercises and Complications: Safe execution of exercises is especially important in individuals at risk of parastomal hernia. Incorrect or overly demanding exercises may increase the intra-abdominal pressure and trigger hernia development. Exercise safety should be ensured through programs planned in accordance with the physical capacity of the individual. For example, sudden and high-intensity movements should be avoided, and controlled and low-intensity exercises should be preferred instead. There is evidence in the literature that low-intensity exercises, especially pilates and yoga, reduce the risk of hernia development. However, heavy weight lifting or high-intensity interval training can put pressure on the abdominal wall and lead to complications. Therefore, exercises should be performed under professional supervision, considering the risk of hernia (17,23-25).

The Role and Importance of Exercise in the Prevention of Parastomal Hernia: The role of exercises in the prevention of parastomal hernia is critical in terms of strengthening the abdominal wall muscles and regulating intra-abdominal pressure. Exercises create a barrier against hernia development by increasing the tone of the abdominal muscles. Core strengthening exercises target the transversus abdominis and obliquus muscles, supporting

the abdominal wall and helping to effectively manage intra-abdominal pressure (16,17). Regular exercises both support the rehabilitation process after surgery and are used as a preventive measure against hernia development. Furthermore, the positive effects of exercises on the overall quality of life contribute to individuals feeling more confident in their daily activities and not avoiding physical activity (16,23).

Effects of Exercise on Parastomal Hernia

The role of exercises in preventing the development of parastomal hernia is closely related to strengthening the abdominal wall muscles and controlling the intra-abdominal pressure. Core exercises target the abdominal muscles, increasing muscular endurance and preventing weaknesses in the abdominal wall. Strong abdominal muscles help stabilise intra-abdominal pressure and keep the tissues around the stoma intact. There is significant evidence in the literature that regular exercise reduces the risk of parastomal hernia. For example, in a randomised controlled trial, exercise programs targeting core muscles were shown to significantly reduce postoperative hernia development (16). The correct implementation of exercises is considered a preventive measure for abdominal wall weakness in postoperative patients (17,24).

Parastomal hernia is a condition that negatively affects the quality of life both physically and psychologically. In these patients, the hernia can have negative effects on body image by disrupting physical appearance (16). Exercises contribute to both physical and psychological recovery in this process. By strengthening the abdominal muscles, exercises can keep the hernia bulge under control and reduce the individual's concerns about their appearance. In addition, regular physical activity increases the release of endorphins and contributes to the reduction of emotional problems such as depression and anxiety (16,17). Furthermore, the implementation of exercise programs in a social environment increases an individual's self-confidence and reduces social isolation. As a result, exercise not only provides a physical improvement but also has a positive impact on the overall quality of life (1,17,20).

The level of physical activity has a direct impact on the hernia size. Regular exercise can slow or stop the growth of hernia size by increasing muscle tone in patients with hernias. Taylor et al. found that parastomal hernias remained smaller in size in physically active individuals and that exercise had a protective effect on hernias (16). Low-to-moderate intensity exercises reduce the pressure on the hernia by stabilising intra-abdominal pressure and may prevent hernia growth. However, excessively heavy exercises or improperly performed movements may increase the intra-abdominal pressure and increase the size of the hernia. Therefore, it is important that exercises are carefully and appropriately planned for hernia patients (16,17).

The Place of Exercise-Based Interventions in Clinical Practice

Recent studies have investigated various surgical techniques and the use of mesh for hernia repair, but the consensus is that strengthening the abdominal wall with exercises is the primary preventive measure. There are studies which show that surgical interventions such as mesh placement can be effective, but cannot replace the need for patients to participate in regular core strengthening activities (21,26). In summary, the literature strongly supports the integration of abdominal wall strengthening exercises into the postoperative care regimen for patients with stomas. This approach not only helps with hernia prevention but also improves the overall recovery and quality of life for these individuals (21,26-28).

The current literature provides evidence supporting the importance of abdominal wall strengthening exercises in preventing parastomal hernia. Randomised controlled trials have shown that exercises that strengthen core muscles reduce postoperative hernia development and help prevent abdominal wall weakness (16,17). Programs such as Pilates, yoga and core exercises are reported to effectively target the abdominal wall muscles and reduce the risk of hernia by regulating intra-abdominal pressure. However, the number of studies on this topic is limited and more evidence is needed, especially in different patient populations. While most studies evaluate short-term outcomes, there is insufficient data on long-term effects. Therefore, exercise-based interventions need to be investigated more extensively (16).

The place of exercise-based interventions in clinical practice is being recognised increasingly every day. Especially in postoperative rehabilitation processes, it is recommended to include exercises that strengthen the abdominal muscles in the treatment plan. Clinical guidelines emphasise the early initiation of exercises in individuals at risk of parastomal hernia (17). However, it is important to implement exercises with an individualised plan. Customised exercise programs according to physical capacity, age, and existing hernia condition can increase patient safety and the effectiveness of the intervention. In order to disseminate exercise-based interventions, it is necessary to have expert physiotherapists to carry out these programs in clinical settings and regular follow-up of exercises in pre- and postoperative processes (16,17).

CONCLUSION

Future research should examine the effectiveness of exercise-based interventions in larger populations and on long-term outcomes. In particular, randomised controlled trials should further investigate the potential of abdominal wall strengthening exercises to prevent herniation and contribute to the treatment process in patients with existing herniation. Studies comparing different exercise types and intensities are critical to determine which exercises are most effective. Furthermore, strategies to increase exercise adherence and motivation need to be investigated. In this context, studies examining the effects of exercises applied individually, in groups or digitally may provide guidance on the implementation methods. While multidisciplinary strategies that integrate exercise-based interventions with surgical techniques have already been discussed in the literature (7,29), future studies are needed to evaluate the practical implementation and long-term effectiveness of such combined approaches in preventing the development of parastomal hernia.

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Author Details

Hamdiye Banu Katran

[1] Marmara University Faculty of Health Sciences, Department of Nursing, Surgical Diseases and Nursing, Istanbul, Türkiye

0000-0001-5095-6316 banu-katran@hotmail.com

Nurgül Arpag

[2] Istanbul Atlas University, Faculty of Health Sciences, Department of Nursing, Istanbul, Türkiye

0000-0002-7774-3844

Sevgi Gür

[3] Selcuk University, Faculty of Nursing, Department of Surgical Diseases and Nursing, Konya, Türkiye

0000-0002-6925-3351

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