

## Original Research Article

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# Ventral hernia from routine repairs to abdominal wall reconstruction: our initial experience

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## ABSTRACT

**Background:** Loss of continuity of abdominal wall significantly affects the functions of protection of viscera, postural stabilization, and maintenance of intra-abdominal pressure. The newer understanding of abdominal wall reconstruction (AWR) aims at restoring abdominal wall anatomy and function, instead of simply patching the defect. We want to showcase the changing trends and results in hernia repair at a Medical Institution.

**Methods:** This is an observational retrospective study conducted in RRMCH, Bengaluru from July 2018-2019 including all patients with ventral hernia undergoing the specified hernia repairs.

**Results:** A total of 54 patients with ventral hernias undergoing routine hernia repairs/AWR surgeries were retrospectively analysed. The overall mean age was  $46.62 \pm 12.44$  year. Majority subjects were females (n=37; 68.5%), and overweight (Mean BMI= $28.07 \pm 3.01/m^2$ ). 14 patients (25.92%), all males, had history of tobacco consumption. There were 38 (70.37%) primary ventral hernias and 7 recurrent hernias. Overall mean defect size was  $10.2 \pm 0.4$  cm. Most frequently performed was open retro rectus Hernioplasty (n=18; 33.33%), followed by open Preperitoneal Hernioplasty (n=17; 31.48%), laparoscopic intraperitoneal onlay mesh (IPOM) (n=16; 29.62%) and open transversus abdominis release (TAR) (n=3; 5.5%). On statistical analysis, it was found that Open repairs had higher post-operative pain ( $p=0.0005$ ), longer hospitalization ( $p=0.0002$ ) and higher incidence of surgical site events ( $p=0.0134$ ) when compared to Laparoscopic repairs.

**Conclusion:** As known already, minimally invasive techniques of hernia surgeries are shown to have acceptable outcomes when compared to radical open surgeries. Newer techniques of AWR are being employed to routine cases in larger numbers, and not just for complex reconstruction, at most centres with acceptable outcomes.

**Keywords:** AWR, Incisional hernia, Minimally invasive surgery, Ventral hernia

## INTRODUCTION

The anterior abdominal wall assists in protection of viscera, postural stabilization, and maintenance of intra-abdominal pressure. Hence, loss of continuity of abdominal wall significantly affects these functions. Routine hernia repairs have a limitation in terms of the size of hernia they can fix and in attending to the important aspect of physiological / functional repair.

AWR can be loosely described as the repair of lax abdominal wall or abdominal wall defect with reinforcement with prosthesis and hence, aims at restoring abdominal wall anatomy and function to near normal. This involves closure of fascia in the midline, often with reinforcement using mesh prosthetics.<sup>1</sup>

Rives-Stoppa's is a well-established technique indicated in repairing large defects, but has a drawback of

limitation in medialization of rectus muscles causing large surfaces of mesh to be located under the skin flaps, hence resulting in surgical site events (SSE) and recurrences.<sup>2-4</sup>

AWR has been recently revolutionized by minimally invasive reconstructive techniques, exponential growth of bioprosthetic have revolutionized. And, introduction of components separation has facilitated closure of both posterior and anterior layers in wide defects, and location of large meshes in a completely preperitoneal space.

Difficult complex abdominal wall hernia is a large challenge for both surgeon and patient. And an ideal surgical approach for difficult ventral hernia repair is still a matter of debate because of difficulty in obtaining a reliable & durable repair, high peri-operative morbidity (abdominal compartment syndrome, respiratory failure), frequent recurrences, and poor quality of life. Hence, the surgical approaches to these problems need to evolve from simply patching the defect to reconstructing functional dynamic abdominal walls.

Aims and objectives of the study were to analyse the outcomes of routine hernia repair and AWR surgery with respect to confounding factors like: BMI, Comorbidities and tobacco consumption, Intra-operative and post-operative surgical complications, Post-operative pain, IV analgesic use, Length of hospital stay, Short-term recurrences (3 months).

## METHODS

This is an observational retrospective study conducted in the Dept. of General Surgery, Rajarajeswari Medical College and Hospital, Bengaluru from July 2018 to July 2019. A total of 113 patients with ventral hernia were assessed, of which, 54 patients were included in the study. (Figure 2A)

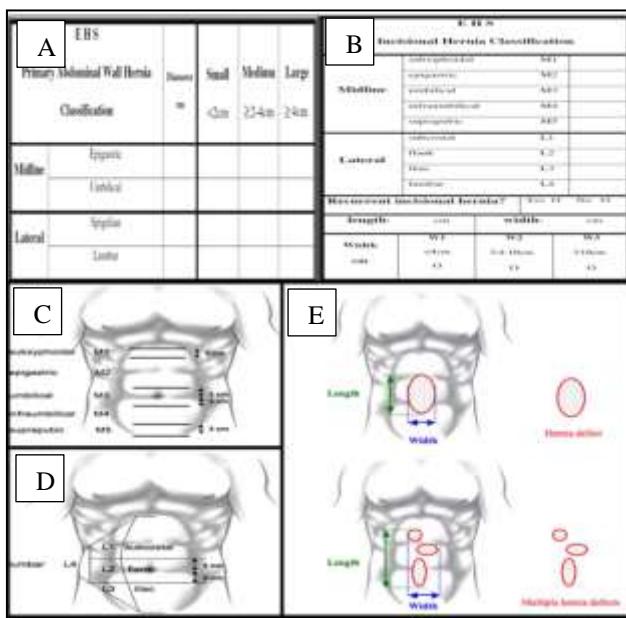
Inclusion criteria for the study was all patients with ventral hernia, European Hernia Society (EHS) Classification of primary ventral hernias and incisional hernias (Figure 1A-E) undergoing the specified hernia repair surgeries.

Exclusion criteria- patients who underwent primary suture repair, and onlay repair for ventral hernias and records with inadequate information, i.e., type of repair, plane of mesh placement.

Medical records of all patients with ventral hernia who underwent hernia repair procedures in RRMCH during the course of study period were retrospectively analysed.

As a part of pre-surgical workup, thorough clinical assessment was performed, the hernias were classified according to the EHS classification based on the defect size and location, and associated comorbidities were

taken into consideration. Patient's general condition was optimized prior to surgery.



**Figure 1: (A) European hernia society classification of primary abdominal wall hernia, (B) European hernia society classification of incisional hernia, (C) five zone classification of midline incisional hernia, between the two lateral margins of the rectus muscle sheath, (D) four zone classification of lateral incisional hernia, lateral to the rectus muscle sheaths, (E) definition of width and length of incisional hernia for single and multiple hernia defects.**

Hernia surgeries performed were\* open retro rectus mesh repair, open TAR (Unilateral and Bilateral) and Laparoscopic ventral hernia repair / IPOM.

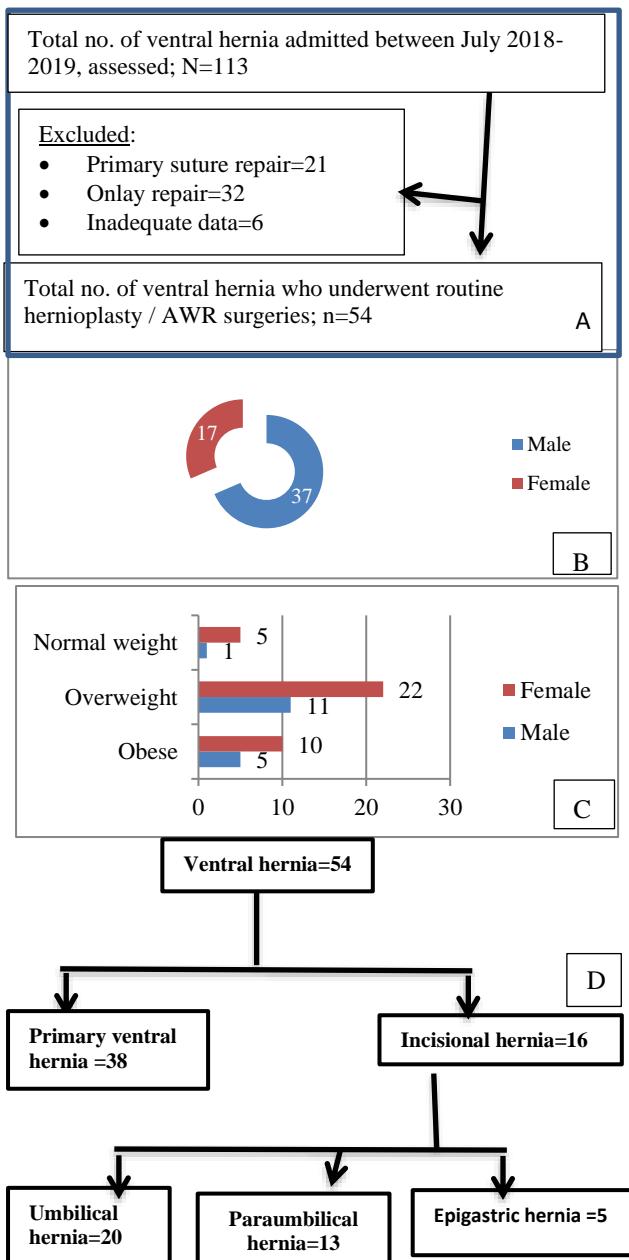
Intra-operatively, the grade of hernia was confirmed according to the EHS classification. Operative notes were studied and surgical reconstruction technique was recorded.

In post-operative care patients remained in the hospital following their surgery until they were ambulatory and their bladder and bowel functions were normal. Drains were left in-situ until the output was  $\leq 50$  ml on two consecutive days. Patients were followed up regularly on a monthly basis for the first 3 months and then, on an as-needed basis, looking for: post-operative pain, IV analgesic use, length of hospitalization, SSE which include surgical site infections (SSI) and wound dehiscence, seroma, skin necrosis or hematoma, and short-term (3 month) recurrences.

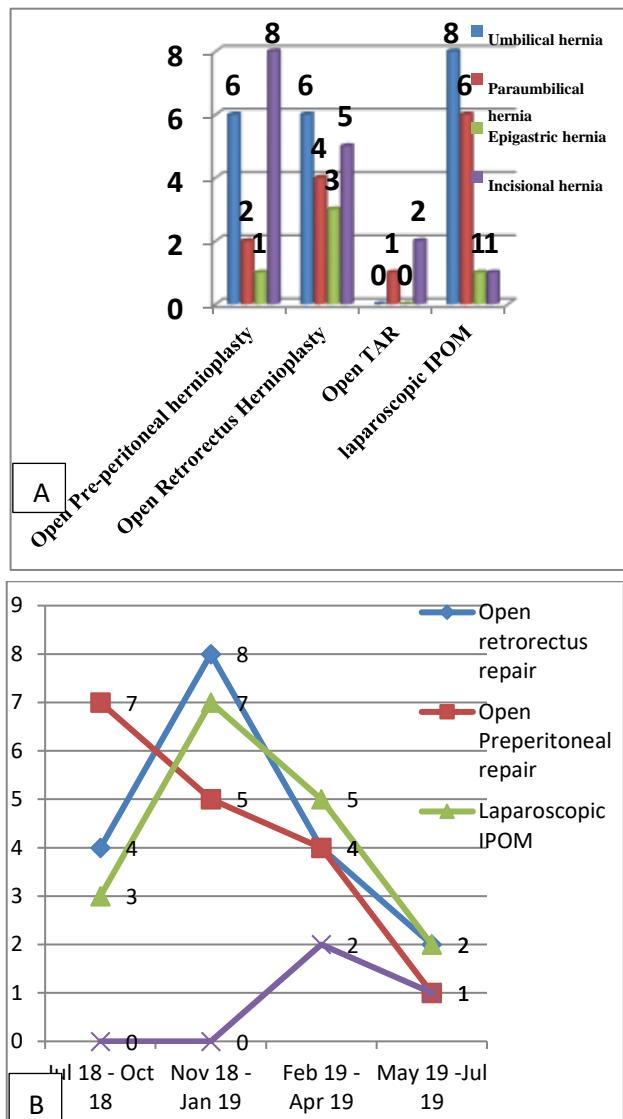
Statistical analysis was performed using SPSS v.18.0. Quantitative variables were expressed as mean and standard deviation. Categorical variables were expressed as absolute numbers and percentages. Comparative analysis was done using students' t test and  $\chi^2$  test.

## RESULTS

A total of 54 patients with ventral hernias undergoing hernia surgeries were retrospectively analysed. The overall mean age of the study population was  $46.62 \pm 12.44$  y (range=24-75 y). Females predominated the group (n=37; 68.5%), and a total of 33 patients (61.1%) were overweight (mean BMI = $28.07 \pm 3.01/m^2$ ). (Figure 2b-c) 14 patients (25.92%), all males, gave a positive history of tobacco consumption and, a total of 26 patients had comorbidities like obesity, hypertension, type-II diabetes mellitus and respiratory disorders (like COPD, bronchial asthma).



**Figure 2: (A) The process of recruitment of subjects for the study, (B) sex distribution, female preponderance, (C) weight distribution, (D) distribution of types of hernia.**



**Figure 3: (A) Types of hernia repair / AWR vs types of hernia, (B) the trend of hernia repairs from July 2018-2019.**

Off the 54 subjects, 38 (70.37%) were primary ventral hernia-umbilical hernia 20 (37.03%), paraumbilical hernia 13 (24.07%) and epigastric hernia 5 (9.26%); and 16 (29.63%) were incisional hernia (Figure 2D). Recurrent hernias accounted for 12.96% of all included subjects. Overall mean defect size was  $10.2 \pm 0.4$  cm. The type of hernia surgery performed versus the type of hernia distribution is as explained in the graph (Figure 3A) and Open Retro rectus repair (18, 33.3%) is the most commonly performed repair followed by open preperitoneal repair (17, 31.48%), Laparoscopic IPOM (16, 29.62%) and open TAR (3, 5.5%) (Figure 3B) depicts the trend of hernia repairs performed during the duration of study from July 2018 to July 2019.

On overall comparison (Table 1), open TAR had the longest mean duration of surgery ( $173.8 \pm 17.5$  mins) and highest mean post-operative pain, VAS on POD1 ( $5 \pm 1$ ).

open retro rectus repair had the longest mean duration of hospitalization ( $18.6 \pm 4.7$  days) and higher incidence of surgical site events n=10 (mean duration following surgery  $3.4 \pm 3.4$  days).

However, on statistical analysis (Table 2), it was found that open hernia surgeries had higher post-operative pain ( $P=0.0005$ ), longer hospitalization ( $p=0.0002$ ) and higher incidence of SSE ( $p=0.0134$ ) when compared to

laparoscopic hernia surgeries. But there was no statistically significant difference noted between the open and laparoscopic groups in terms of operative time ( $p=0.55$ ), time of ambulation following surgery ( $p=0.24$ ) and correlation of operative time ( $<120$  v/s  $\geq 120$  min) and incidence of SSE ( $p=0.88$ ). There was also no significant association noted between comorbidities ( $p=0.76$ ) or tobacco consumption ( $p=0.48$ ) and the incidence of SSE.

**Table 1: Summary of endpoints assessed.**

Parameters	Laparoscopic IPOM	Open retro-rectus hernioplasty	Open pre-peritoneal hernioplasty	Open transversus abdominis release
<b>Total number N (%)</b>	16 (29.62)	18 (33.33)	17 (3.48)	3 (5.55)
<b>Types of hernia</b>				
Umbilical	8 (50)	6 (33.33)	6	-
Para-umbilical	6	4	2	1
Incisional	1	5	8 (47.05)	2 (66.66)
Epigastric	1	3	1	-
<b>Median defect size (cm)</b>	11.3	10.8	11.8	12.2
<b>Median age (range) (years)</b>	45y (26-66)	45y (31-65)	55y (26-75)	30y (24-35)
<b>Male: Female</b>	3:5	5:13	5:12	1:2
<b>Presence of comorbidities</b>	8	8	6	1
<b>Tobacco consumption</b>	6	5	2	1
<b>Operative time (mean) (min)</b>	90-190 ( $138.1 \pm 28.0$ )	80-195 ( $130.3 \pm 37.4$ )	75-180 ( $128.2 \pm 28.7$ )	160-195 ( $178.3 \pm 17.5$ )
<b>Postop pain; POD1 (mean) VAS score</b>	2 to 5 ( $3.2 \pm 0.8$ )	2 to 5 (3.3±0.8)	3 to 6 (4.6±0.8)	4 to 6 (5±1)
<b>IV analgesics (mean) (days)</b>	2 to 4 (3)	2 to 4 (3)	2 to 4 (3)	2 to 4 (3)
<b>Mobilization (mean) (days)</b>	1 to 4 (2.5)	1 to 3 (2)	1 to 4 (2.5)	2 to 3 (2.5)
<b>Surgical site events (SSE)</b>	n=1 (4 months)	n=10 (POD4 to POD10; mean=3.4±3.4)	n=5 (POD1 to POD18; mean=9.5)	N=1 (POD7)
<b>Length of hospitalization (days)</b>	9 to 27 ( $13.5 \pm 4.1$ )	10 to 25 ( $18.6 \pm 4.7$ )	9 to 27 ( $15.7 \pm 5.6$ )	12 to 19 ( $15.3 \pm .5$ )

POD1- Post-operative day 1; VAS- Visual Analogue Scale

**Table 2: Summary of statistical analysis of the various parameters assessed.**

Parameters	Results of statistical analysis	P value	Inference
<b>Operative time in laparoscopic vs open repairs</b>	$X^2=0.355$	$P=0.55 (>0.05)$	Significant
<b>POD1 following Laparoscopic vs open repairs</b>	$t=3.69$	$P=0.0005 (<0.05)$	Not significant
<b>Time of mobilization following laparoscopic vs open repairs</b>	$t=1.169$	$P=0.24 (>0.05)$	Significant
<b>Length of hospitalization for laparoscopic vs open repairs</b>	$X^2=13.89$	$P=0.0002 (<0.05)$	Not significant
<b>Incidence of SSE in primary ventral vs incisional hernia</b>	$Z=1.869$	$P=0.06 (>0.05)$	Significant
<b>Incidence of SSE following laparoscopic vs open repairs</b>	$X^2=6.0879$	$P=0.0137 (<0.05)$	Not significant
<b>Age-wise incidence of SSE following hernia repair</b>	$X^2=1.391$	$P=0.4988 (>0.05)$	Not significant
<b>Sex-wise incidence of SSE following hernia repairs</b>	$Z=-0.0008$	$P=0.994 (>0.05)$	Not significant
<b>Association between comorbidities and SSE following hernia repair</b>	$X^2=0.060$	$P=0.76 (>0.05)$	Not significant
<b>Association between tobacco consumption and incidence of SSE following hernia repair</b>	$X^2=0.482$	$P=0.48 (>0.05)$	Not significant
<b>Correlation between operative time and incidence of SSE following laparoscopic vs open repair</b>	$P=0.88$	$P=0.88 (>0.05)$	Not significant

$X^2$ - Chi square test; Z- Z test; P- P value; POD1- Post-operative day 1; SSE- Surgical site events.

## DISCUSSION

There are currently few studies available comprehensively analysing the outcomes of various hernia techniques for ventral hernias in the literature. A 2015 retrospective study analysing the outcomes of open retro muscular mesh repair of 225 complex incisional hernias by Cobb WS, Warren JA et al, reported surgical site events accounting to 37.7%. It also reported recurrence of 16.9%, with an average time of recurrence following repair=19.2 months and SSI being an important predictor of recurrence. Incidence of SSI was 19.6%, with predictors being history of mesh infection and recurrent hernia repair.<sup>5</sup> However, our study reports an incidence of surgical site events of 55.5%, surgical site infections of 11.11% and zero recurrence.

Another 2016 prospective comparative analysis of open retro muscular mesh repair and Laparoscopic IPOM for ventral hernia showed significant deviation to the disadvantage of open retro muscular mesh repair in terms of: Duration of surgery ( $0.55\pm0.25$  v/s  $2.10\pm0.4$ hr), Analgesic requirement ( $2.84\pm0.6$  v/s  $5.47\pm2.16$  days), Duration of hospital stay ( $2.6\pm0.95$  v/s  $6.88\pm1.5$  days), Surgical site events (6% v/s 40%).<sup>6</sup>

Our study also depicts a significant disadvantage of open retro muscular repair in terms of surgical site events ( $P=0.0022$ ) and a significant overall mean length of hospitalization (18.6 v/s 13.5 days).

A 2019 registry-based, propensity score-matched prospective comparison of outcomes of laparoscopic IPOM and open sublay technique for 9907 elective hernia repairs showed statistically significant higher rate of surgical post-operative complications (10.5 vs 3.4%) and longer hospitalization ( $6.14\pm5.29$  days vs  $4.35\pm3.32$  days) in the open sublay group; however, a higher rate of intra-operative complications (2.3 vs 1.3%) in the laparoscopic IPOM group.<sup>7</sup>

Another 2012 retrospective study by Novitsky YW, Elliott HL et al analysing the results of Transversus abdominis muscle release as a novel technique in AWR reported post-operative surgical site events of 24%, as opposed to in our study which reported 33.33% SSE.<sup>8</sup>

On statistical analysis in this study, in comparison with laparoscopic, open techniques have shown to have: Higher post-operative pain POD1 (VAS), Longer duration of hospital stay and Higher incidence of SSE.

## CONCLUSION

Minimally invasive techniques of routine hernia repairs / AWR have shown to have acceptable outcomes when compared to radical open surgeries.

And although our study has only depicted a lower mean post-operative pain, shorter hospital stays and lower

incidence of SSE in laparoscopic techniques compared to open repairs, in the 3-month follow-up period, longer duration of follow-up is necessary to determine long-term recurrences, and prospective study with larger population is necessary to better analyse the mentioned variables.

## Comment

The observation depicts a fresh new trend towards indulgence and acceptance of newer AWR repair even for smaller hernias. It also projects decent outcomes with component separation techniques in a Medical college setting. Dissipation of knowledge of AWR and its implementation should be encouraged in all set-ups with the help and support of experts in the field.

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