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OPEN "TENSION FREE" HERNIOPLASTY VERSUS CONVENTIONAL REPAIR CLINICAL, BIOCHEMICAL AND IMMUNOLOGIC STUDY

By
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Background*: Extensive clinical research has been undertaken to assess the outcome following inguinal hernia repair as over 80 techniques described since 1887 when Bassini reported his method.*
Objective: *Clinical assessment of postoperative pain on mobilization in tension free hernioplasty and conventional repair. Objective laboratory study of stress response reflected by the total and differential leucocytic count. Study of the Th1 inflammatory and Th2 compensatory response and their relationship. Measure the systemic inflammatory response of hernioplasty repair. Evaluate the immediate and 2 years follow up of hernia surgery.*
Methods: *Forty-five male patients with primary indirect inguinal hernias were treated with elective operations, and separated into 3 group, group I treated by Bassini hernioraphy group II operated upon using Shouldice procedure group III treated by tension free hernioplasty using polyperoline mesh, another control healthy volunteers were included. Serum venous samples collected at 24h, 72h and in the 7th postoperative day to detect total leucocytic count, differential leucocytic count, interleukin-12, interleukin-13 and glutathione peroxidase.*
Results: *This study evidences that Lichtension hernia patients had less pain scores, sequential pain score for 1st, 3rd, 7th, 2nd week were 3.5, 2.37, 1.37, 0.46 significant leukocytosis and neutrophilia, polarization towards the inflammatory (Th1) response, unmodified serum glutathione peroxidase.*
Conclusion: *Our data show that the Lichtenstein hernia repair induces less pain, useful acute, local inflammatory response followed by limited fibroblastic activity with out dangerous systemic inflammatory response*

Keywords: Hernia, Tension free, Interleukin (12&13)

INTRODUCTION

Now open tension free hernioplasty has become popular due to less pain, short convalescence and low recurrence rate [1] as the mesh reinforce the inguinal canal floor, create a new ring and shutter mechanism [2].

Many studies have highlightened the pain prevalence in post repair patient as significant and disabling complication, [3] that pain is somatic, its intensity and duration is dependent on the surgical technique choice [4] and produced by direct stimulation of the mechanoheat polymodal nociceptors that respond to alogens, excessive pressure and temperature [5].

The surgical stress response induced by surgery is an integrated result of immunologic, haematologic, metabolic and vascular cell biologic systems interactions [6], triggered by activating the complement, coagulation and kinin cascades, its intensity is dependent on the magnitude of surgical trauma [7] and its eventual goal to allow tissue repair with minimal disruption of host's physiology [8].

The significant immunologic interactions include controlled macrophages activation producing balanced

proinflammatory (Th1) and antiinflammatory (Th2) cytokines [9] leukocytic and endothelial cells interaction releasing chemokines [10] superoxide release [11], controlled neutrophil priming, activation and apoptosis [12].

The interleukin-12 is a critical proinflammatory cytokine increasing the cytokines production, proliferation and cytotoxicity of both the T cells and the natural killer cell [13] so the interleukin-12 marker the T helper inflammatory response (Th1) [14].

The interleukin-13 is of crucial role in the compensatory anti-inflammatory response syndrome (CARS) [15] acting by direct inhibition of genetic transcription of proinflammatory cytokines or by direct union with these cytokines preventing their action on their target receptors [16].

The released oxygen free radicles are highly reactive, attack the phospholipid membrane, degrade collagen and disrupt the lysosomes causing extensive intracellular damage [14].

The immediate post hernioraphy complications include pain, infection (0-0.4%) [18], hydrocele formation (0.71%) [18], seroma (0-2%), and haematoma (1-6%) [20] while the significant remote complications include recurrence (2-3% to 20%) and testicular atrophy (0.1-1%) [21].

PATIENTS AND METHODS

This study was carried on 3 groups of male patients with elective hernia, with no patient had metabolic, endocrine, hepatic or renal diseases at Mansoura University Hospital, Surgery Department from January 2000 to July 2000.

Randomly group [1] contained 15 patients treated by Bassini repair, group [2] contained another 15 patients treated by Shouldice repair and group [3] 15 patients treated by tension free hernioplasty as described by Maddern et al. [22].

Eleven healthy volunteers without any operations were selected as a control group.

Postoperative pain detection was done using the visual analoge scale [23] while sample collection for chemical analysis using collected peripheral venous samples at 24 hours, 72 hours and 7th day postoperative for detection of total and differential leucocytic count, serum interleukin-12 and serum interleukin-13 using ELISA kits [24] and glutathione peroxidase detection [25] .

The patients discharged at 7th postoperative day, followed up in the outpatient clinic weekly for the first month and every 3 months for 2 years.

RESULTS

The patients mean age and operative time are illustrated in (Table 1):

Pain:-

Analysis at 24 hours, 72 hours, 7th day and 2nd week revealed the mean visual analoge pain scores on mobilization were significantly reduced in Lichtenstein hernia patients at 24 hours, 72 hours, 7th day and 2nd week postoperatively when compared with either Shouldice patients or Bassini subjects, and similarly Shouldice patients when compared with the Bassini patients as in (Fig 1)

Leukocytes and neutrophils:-

Analysis at 24 hours, 72 hours and 7th day postoperative showed a significant leukocytosis and neutrophilia has been detected in the Lichtenstein hernia patients at 24 hours and 72 hours when compared with either Shouldice or Bassini groups, but the Shouldice group failed to achieve that difference when compared with the Bassini group. Otherwise no significant difference among the 3 studied groups and the control group or between the 3 studied groups on the 7th postoperative day as in (Fig 2,3)

Serum interleukin-12:-

Analysis of serum level at 24 hours, 72 hours, and 7th postoperative day revealed the Lichtenstein hernia patients achieved the only significant increase at 24 hours and 72 hours postoperative (Fig 4).

Serum interleukin-13:-

Analysis at 24 hours, 72 hours and postoperative day revealed only a significant difference in the studied groups when compared with the control group at 24 hours postoperative using one way Anova test as in (Table 2).

Glutathione peroxidase level:-

Its biochemical analysis at 24 hours, 72 hours and 7th postoperative day revealed no significant changes between the studied groups and the control group or among the 3 studied groups (Fig. 5).

Immediate postoperative complications:-

There were only higher clinical but not statistical increase in the seroma incidence within the Lichtenstein hernia group.

Late postoperative complications:-

There were two recurrent cases among the Bassini hernia group and one case among the Shouldice patients

with no recurrence in the tension free group.

Also no detectable testicular atrophy in the present study, but single patient with inguinodynia responding to local anaesthesia injection in the Bassini group.

Table (1): ***Mean age and operative time of studied groups***

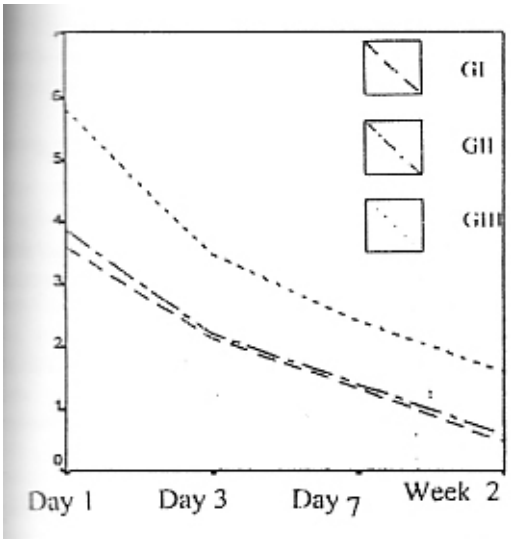
	Group I	*Group II*	*Group III*	*P-value*
Age (in years)	*43.33*	*39.26*	*45.2*	*>0.05*
Operative time in minutes	*30+12*	*35+11*	*33+14*	*>0.05*

Table (2): ***Postoperative serum interleukin 13.***

	G1	*G2*	*G*	*Test of sig.*
1st day	*17.20*	*29.71*	*32.51*	*P<0.005 **
3rd day	*28.07*	*29.31*	*29.70*	*P>0.05*
7th day	*16.85*	*16.09*	*17.02*	*P>0.05*

One way ANOVA test was used.
Student t-test between each group.

	1st day		*3rd day*		*7th day*	
	t	*P*	*T*	*P*	*t*	*P*
GI vs G1	*1.78*	*0.06*	*1.78*	*0.06*	*1.55*	*0.16*
GI vs G2	*1.39*	*0.17*	*1.23*	*0.07*	*1.19*	*0.26*
GI vs V3	*1.85*	*0.06*	*1.79*	*0.06*	*1.63*	*0.20*



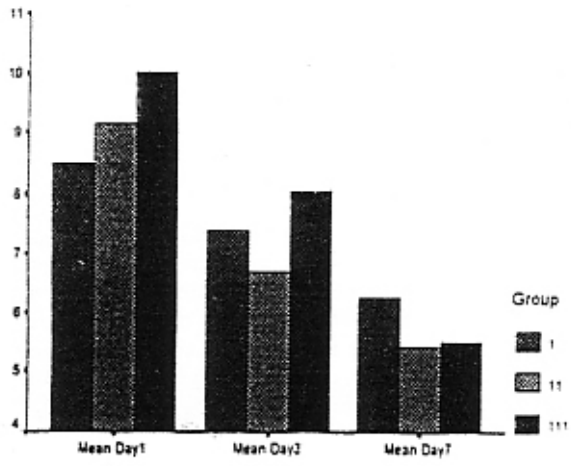


Fig. (1): postoperative pain of studied groups

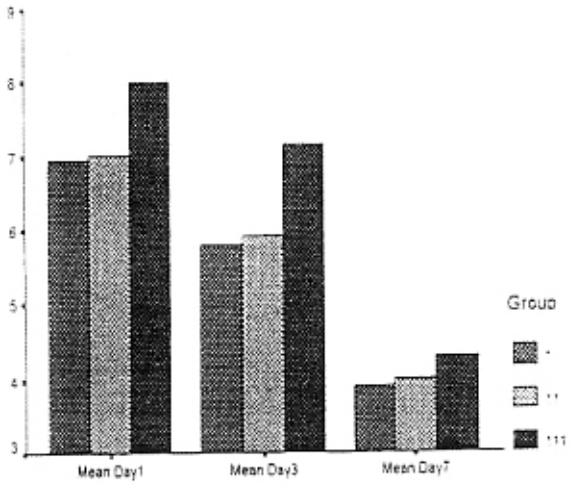


Fig (2): :Leucocyte of the studied groups

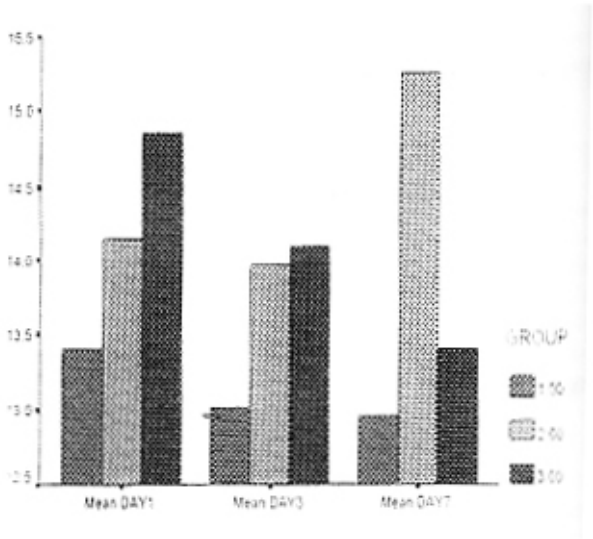


Fig (3): Neutrophil of the studied groups

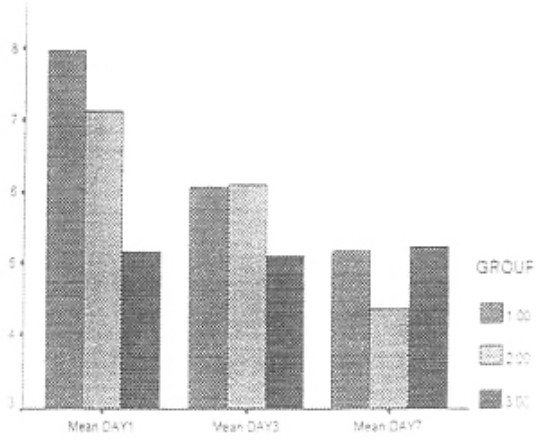


Fig. (4): OIL 12 of the studied groups

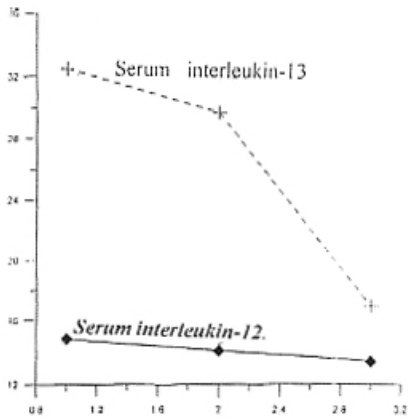


Fig (5): Glutathione peroxidase of the studied groups

Fig (6): Serum level of IL-13 in the tension free group.

DISCUSSION

Results of this study indicate the Lichtenstein hernia patients have low pain score than conventional repair similar to that reported by Kawji et al. (1999) [26], in contrast to Barth et al. (1998) [27] and these mentioned results emphasize the importance of dependent patient assessment with respect to pain scores, analgesics potency and duration, and return to normal activities.

From the stand point of acute inflammatory response this study revealed significant objective laboratory changes in the total leucocytic count, neutrophil count and cytokine network modification in all hernia repair similar to that reported by Di Vita et al. (2000) [28] and that called attention to the inflammatory reaction secondary to dissection and reinforcement of posterior inguinal wall.

Paradoxically the tension free patients had the highest inflammatory soup but the lowest pain scores and this explain the absence of tissue tension on the polymodal mechano heat receptors.

Nevertheless in the tension free patients the procedure is associated with the highest increase in the inflammatory mediators. Neutrophils, leukocytes, IL-12 supported by the evident polarization of inflammatory response (Th1) manifested by increased IL-12 level with insignificant IL-13 level so the mesh cause foreign body reaction. In contrast to Gurleyik et al. (1998) [29] and this is explained by the use of general anaesthesia in the Gurleyik group that mask the difference between the studied group [30].

Moreover, the rapid off switch of the intense inflammation (7th day postoperative insignificant changes of neutrophil, leukocytes & IL-12, IL-13) in the Lichtenstein repair group supported clinically by absence of both local and systemic complications of inflammation is related to neutrophil apoptosis and rapid clearance of inflammation even in the presence of mesh so called attention to the fact that the peroline mesh is not only of high biologic inertia, but also induce useful acute inflammatory reaction (not disturb host's physiology), followed by limited fibroblastic activity (allow eventual tissue healing with strong scar) as reported by [31]. So, the mesh is both therapeutic and prophylactic against any future metabolic dysfunction similar to that reported by [32].

Moreover the early interleukin-13 peak (1st day) (Fig 6) is indicative of early immunologic activity and not a stimulus (as reported by Karp, 2001) [33] and this implies the existence of a regulatory mechanism to limit the "Friendly fire" damage caused by the inflammatory response converting it into useful response.

The insignificant changes in the glutathione peroxidase level denote the systemic inflammatory response is not high to activate the free radicals of which the glutathione peroxidase is a scaranger [34].

In clinical practice the high incidence of seroma in tension free group is explained by the intense local inflammatory response similar to that reported by (Walker et al., 1995) [35] while the insignificant changes as regard the long term follow up are indicative for the need for larger and longer series.

CONCLUSION

Our study revealed objective clinical and laboratory advantages for open tension free hernioplasty over other conventional repair as it is associated with, less pain score inspite of excessive inflammatory soup acute useful inflammatory reaction followed by limited fibroblastic activity, moreover, the mesh of high biologic inertia not disturb the systemic inflammatory response.

But, the different pain scores of different investigators suggest the need for complementary estimation of analgesics potency & duration and return to normal activity. Also, all types of hernia induce inflammatory reaction but the mesh in Lichtenstein type induce the most intense response.

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