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Clinical Outcomes of Ilioinguinal Nerve Preservation Versus Elective Division During Open Lichtenstein Mesh Repair of Inguinal Hernia: A Prospective Comparative Cohort Study.

Dr. Sadiya Semaub[1], Dr. A. Shivakumar[2]*, Dr. ADV Lavanya[2]
[1]Postgraduate Student, Department of General Surgery, Andhra Medical College and King George Hospital, Visakhapatnam, Andhra Pradesh, India.
[2]Assistant Professor, Department of General Surgery, Andhra Medical College and King George Hospital, Visakhapatnam, Andhra Pradesh, India.

ABSTRACT

Background:
Chronic postoperative inguinal pain is an important cause of impaired recovery after open inguinal hernia repair. Ilioinguinal nerve entrapment, traction, fibrosis, or neuroma formation can contribute to persistent neuralgia, while prophylactic nerve division raises concern regarding sensory loss.

Objectives:
To compare postoperative groin pain, pain severity, hypoesthesia, and numbness after ilioinguinal nerve preservation versus elective division during Lichtenstein mesh repair.

Methods:
This prospective comparative cohort study enrolled 100 adults with uncomplicated inguinal hernia at King George Hospital, Visakhapatnam, from January 2023 to June 2024. Patients underwent Lichtenstein polypropylene mesh repair with ilioinguinal nerve preservation or elective excision. Ninety patients completed six-month follow-up: 44 in the preservation group and 46 in the excision group. Pain was graded using a four-point verbal scale, and sensory outcomes were assessed on postoperative day 1 and at 1, 3, and 6 months.

Results:
At six months, postoperative neuralgia occurred in 22.7% of the preservation group and 2.2% of the excision group (P=0.003). A significant difference was also present at three months (45.4% vs 8.7%; P=0.001), whereas the one-month difference was not significant. Mean pain severity progressively declined in both groups and remained lower after excision. Six-month hypoesthesia was 11.4% versus 13.0% (P=0.808), and numbness was 13.6% versus 13.0% (P=0.934), with no significant between-group differences.

Conclusion:
Elective ilioinguinal nerve division during open Lichtenstein repair was associated with substantially less chronic groin pain at three and six months without a detectable increase in hypoesthesia or numbness during the observed follow-up.

Recommendations:
Careful identification of the ilioinguinal nerve remains essential. Elective division can be considered in selected patients undergoing open Lichtenstein repair, supported by preoperative counselling and longer-term outcome surveillance.

Keywords: Chronic postoperative inguinal pain; ilioinguinal nerve; inguinal hernia; Lichtenstein repair; neurectomy; neuralgia; hypoesthesia.
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Corresponding Author: Dr. A. Shivakumar
Email: ambati.shivakumar@gmail.com
Assistant Professor, Department of General Surgery, Andhra Medical College and King George Hospital, Visakhapatnam, Andhra Pradesh, India

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INTRODUCTION

Inguinal hernia repair is among the most frequently performed operations in general surgery, and mesh-based repair remains a central component of contemporary adult groin-hernia management [1-3]. The Lichtenstein tension-free technique established a reproducible open approach in which a polypropylene prosthesis reinforces the posterior wall without tissue-tension suturing [6]. As recurrence rates have declined, postoperative quality has increasingly been judged by patient-centred outcomes, particularly pain, sensory disturbance, functional recovery, and return to normal activity. Chronic postoperative inguinal pain (CPIP), generally defined as pain persisting beyond three months after repair, is therefore a clinically important complication rather than a minor postoperative symptom [1,4].

Recent evidence confirms that persistent pain remains common after inguinal hernia surgery. A 2024 systematic review and meta-analysis estimated a pooled chronic-pain incidence of approximately 17%, with preoperative pain, intense postoperative pain, younger age, female sex, prior ipsilateral repair, and postoperative complications among identified risk factors [3]. Earlier systematic review data likewise showed that chronic pain after mesh repair can restrict leisure and daily activities and can be moderate or severe in a meaningful subgroup [5]. Its pathogenesis is multifactorial, involving nociceptive inflammation, mesh-related fibrosis, fixation-related irritation, and neuropathic injury to the ilioinguinal, iliohypogastric, or genital branch of the genitofemoral nerve [4].

The ilioinguinal nerve is especially relevant during an anterior open repair because it traverses the operative field and can be stretched, divided unintentionally, entrapped by sutures, or incorporated into scar tissue. Traditional prevention strategies have emphasized deliberate identification and protection of inguinal nerves, with pragmatic resection when a nerve is visibly injured or interferes with mesh placement [1,4,12]. However, elective ilioinguinal neurectomy has been investigated as a preventive strategy on the premise that controlled division avoids later entrapment and neuroma-producing trauma. Randomized and observational studies have produced mixed findings: some report lower chronic pain after neurectomy without a significant increase in sensory morbidity, whereas others show little or no durable pain advantage [7-11]. This uncertainty has sustained debate regarding routine preservation versus planned division.

Against this background, the present study compared two ilioinguinal nerve-management strategies during open Lichtenstein mesh repair in adults with uncomplicated inguinal hernia. The objectives were to determine whether elective ilioinguinal nerve division reduced postoperative neuralgia and pain severity compared with nerve preservation, and to compare postoperative hypoesthesia and numbness between the two groups through six months of follow-up. The study also examined baseline clinical and hernia characteristics to describe the treated population and to interpret postoperative outcomes in the context of established evidence.

METHODOLOGY

Study design

This was a hospital-based prospective comparative cohort study involving adults undergoing open Lichtenstein mesh repair for inguinal hernia. Participants were prospectively followed according to the intraoperative ilioinguinal nerve-management strategy used: nerve preservation (Group A) or elective division/excision (Group B). A total of 100 participants were included, with 50 patients in each group. Postoperative outcomes, including groin pain, pain severity, hypoesthesia, and numbness, were assessed at predefined intervals up to six months after surgery. The study was therefore designed to prospectively compare clinical outcomes between the two operative nerve-management strategies over the follow-up period.

Study setting

The study was conducted in the Department of General Surgery, King George Hospital, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India, from January 2023 to June 2024.

Participants

Adults aged 18 years or older with uncomplicated direct or indirect inguinal hernia who were willing to undergo investigations, provide written informed consent, and participate in follow-up were eligible. Exclusion criteria were age below 18 years, diabetes mellitus, recurrent or complicated inguinal hernia, previous surgery in the inguinal region, prior groin injury or pain, mesh allergy or relevant postoperative hernia-repair complication, and unwillingness to participate. Although bilateral hernias were recorded, one side was operated during the indexed procedure.

Study size

A total of 100 participants were included in the study, with 50 patients in each nerve-management group. The sample size was determined based on the anticipated difference in postoperative chronic groin pain between patients undergoing ilioinguinal nerve preservation and those undergoing elective nerve division, while maintaining adequate representation in both comparison groups. Equal allocation was adopted to improve the precision and comparability of between-group estimates. Allowing for possible loss during postoperative follow-up, 100 participants were enrolled. Of these, 90 participants completed the six-month follow-up and were included in the

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final analysis, comprising 44 patients in the nerve-preservation group and 46 patients in the elective-division group.

Bias

Potential selection bias was addressed by applying the same predefined eligibility criteria to both study groups. Performance-related variability was reduced by using the same open Lichtenstein mesh technique, spinal anaesthesia, perioperative antibiotic regimen, and postoperative analgesic approach in both groups. Measurement bias was limited through prespecified follow-up time points, a defined four-point verbal pain scale, and standardized sensory assessment using the Semmes-Weinstein monofilament test with the contralateral side as an internal comparison. Attrition was reported separately for each group. Because allocation-concealment and blinded outcome-assessment procedures were not documented in the available source protocol, these safeguards are not claimed and are acknowledged as potential sources of residual bias.

Operative technique and exposure

All procedures were performed under spinal anaesthesia using the standard open Lichtenstein tension-free mesh technique, which is based on reinforcement of the inguinal floor with polypropylene mesh [6]. In the nerve-preservation group (Group A), the ilioinguinal nerve was identified and protected from traction, sutures, and mesh entrapment. In the elective-excision group (Group B), the ilioinguinal nerve was deliberately divided/excised as described in the operative protocol. Polypropylene mesh and polypropylene sutures were used. Both groups received a broad-spectrum antibiotic approximately 30 minutes before surgery and for three postoperative days; diclofenac sodium was administered for two days and thereafter as required.

Outcome assessment and follow-up

Patients were evaluated on postoperative day 1 and at 1, 3, and 6 months. The primary outcome was postoperative groin pain/neuralgia, with chronic postoperative inguinal pain interpreted in accordance with the accepted three-month threshold [1,4]. Pain severity was graded on a four-point verbal scale: 0, none; 1, mild intermittent discomfort without restriction of normal activity; 2, moderate pain interfering with daily activity; and 3, severe pain preventing usual activity. Secondary outcomes were hypoesthesia and numbness. Sensory assessment covered five cutaneous regions around the groin incision and used the Semmes-Weinstein monofilament test, with the contralateral side as an internal comparison.

Ethical considerations

Prior approval was obtained from the Institutional Ethics Committee, Andhra Medical College, Visakhapatnam (Reg. No. EC/NEW/INST/2019/397; approval serial no. 68/IEC AMC/MAR 2023). Written informed consent was obtained from every participant before enrolment and surgery, and confidentiality of participant information was maintained throughout the study.

Statistical analysis

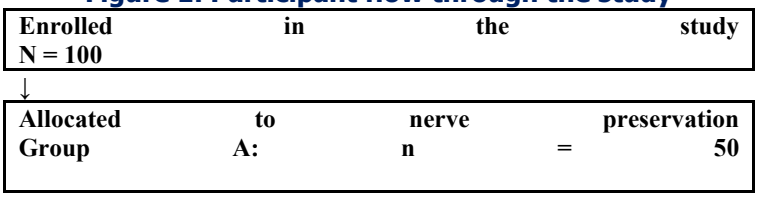
Data were analysed using Statistical Package for the Social Sciences software, version 11.0 (SPSS Inc., Chicago, IL, USA). Categorical variables were summarized as frequencies and percentages. Pearson's chi-square test was used for between-group comparisons of categorical variables when expected cell-frequency assumptions were satisfied; Fisher's exact test was used for 2 x 2 comparisons when expected cell counts were small. Continuous variables were summarized as mean +/- standard deviation and compared between the two independent groups using Student's independent-samples t-test. All statistical tests were two-sided, and $P<0.05$ was considered statistically significant.

RESULTS

Participant flow

A total of 100 participants were enrolled, with 50 patients included in the ilioinguinal nerve-preservation group (Group A) and 50 in the elective nerve division/excision group (Group B). During the six-month follow-up period, six participants in Group A and four participants in Group B were lost to follow-up. Accordingly, 44 patients in the preservation group and 46 patients in the excision group completed follow-up and were included in the final analysis, yielding an overall follow-up completion rate of 90.0% (90/100).

Figure 1. Participant flow through the study



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Allocated to elective nerve division/excision Group B: n = 50

↓

Lost to follow-up Group A: n = 6 Group B: n = 4

↓

Completed 6-month follow-up and analyzed Group A: n = 44 Group B: n = 46 Total analyzed: N = 90

Baseline demographic and presentation characteristics are summarized in Table 1.

Table 1: Baseline demographic and clinical characteristics of the analyzed participants (n=90)

Characteristic	Category	Overall n (%)	Preservation n=44	Excision n=46	P value
Age, years	Mean ± SD	—	52.3 ± 14.0	51.6 ± 10.9	—
Age group	21–30 years	6 (6.7)	5 (11.4)	1 (2.2)	—
	31–40 years	12 (13.3)	6 (13.6)	6 (13.0)	—
	41–50 years	27 (30.0)	8 (18.2)	19 (41.3)	—
	51–60 years	16 (17.8)	9 (20.5)	7 (15.2)	—
	61–70 years	29 (32.2)	16 (36.4)	13 (28.3)	—
Sex	Male	88 (97.8)	42 (95.5)	46 (100.0)	0.144
	Female	2 (2.2)	2 (4.5)	0 (0.0)	
Presentation	Swelling only	73 (81.1)	35 (79.5)	38 (82.6)	0.711
	Swelling with pain	17 (18.9)	9 (20.5)	8 (17.4)	
Predisposing factor	BOO	16 (17.8)	11 (25.0)	5 (10.9)	0.540
	Constipation	25 (27.8)	13 (29.5)	12 (26.1)	
	Chronic cough	4 (4.4)	2 (4.5)	2 (4.3)	
	No obvious factor	45 (50.0)	18 (40.9)	27 (58.6)	

Note. Values are n (%) unless stated otherwise. BOO = bladder outlet obstruction; SD = standard deviation. The 41–50-year overall percentage was recalculated from the source count (27/90).

The cohort was predominantly male (97.8%), and the majority presented with swelling without pain (81.1%). The age range was 26–70 years. The preservation and excision groups had similar mean ages, sex distribution, presentation pattern, predisposing factors, and hernia type. Hernia laterality differed between groups: right-sided hernia was more frequent in Group A, whereas left-sided hernia was more frequent in Group B (P=0.033). Overall, indirect hernias accounted for 54.4% of cases. These operative characteristics are shown in Table 2.

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Table 2: Hernia characteristics according to ilioinguinal nerve-management group

Characteristic	Category	Overall n (%)	Preservation n=44	Excision n=46	P value
Location	Right	48 (53.4)	29 (65.9)	19 (41.3)	0.033
	Left	30 (33.3)	9 (20.5)	21 (45.7)	
	Bilateral	12 (13.3)	6 (13.6)	6 (13.0)	
Type	Direct	41 (45.6)	18 (40.9)	23 (50.0)	0.387
	Indirect	49 (54.4)	26 (59.1)	23 (50.0)	

Postoperative neuralgia declined over time in both groups, but the reduction was substantially greater after elective nerve excision. On postoperative day 1, neuralgia was present in 97.7% of the preservation group and 76.1% of the excision group (P=0.003). At one month, the difference was not statistically significant (52.3% vs 41.3%; P=0.297). By three months, neuralgia affected 45.4% versus 8.7% (P=0.001), and at six months it affected 22.7% versus 2.2% (P=0.003), respectively (Table 3).

Table 3: Incidence of postoperative neuralgia during follow-up

Follow-up	Preservation n=44, n (%)	Excision n=46, n (%)	P value
Postoperative day 1	43 (97.7)	35 (76.1)	0.003
1 month	23 (52.3)	19 (41.3)	0.297
3 months	20 (45.4)	4 (8.7)	0.001
6 months	10 (22.7)	1 (2.2)	0.003

Pain intensity followed the same pattern. Mean verbal pain scores were 1.73±0.66 versus 1.33±0.94 on postoperative day 1, 0.84±0.94 versus 0.41±0.49 at one month, 0.68±0.88 versus 0.09±0.28 at three months, and 0.27±0.54 versus 0.02±0.15 at six months in the preservation and excision groups, respectively. The source analysis reported no significant severity difference on postoperative day 1, but significant differences at 1, 3, and 6 months. At six months, moderate pain persisted in two preservation-group participants, while only one excision-group participant reported mild pain (Table 4).

Table 4: Distribution and mean severity of postoperative groin pain

Follow-up	Group	None	Mild	Moderate	Severe	Mean ± SD
POD 1	Preservation	1	14	25	4	1.73 ± 0.66
POD 1	Excision	11	13	18	4	1.33 ± 0.94
1 month	Preservation	21	11	10	2	0.84 ± 0.94
1 month	Excision	27	19	0	0	0.41 ± 0.49
3 months	Preservation	24	12	6	2	0.68 ± 0.88
3 months	Excision	42	4	0	0	0.09 ± 0.28
6 months	Preservation	34	8	2	0	0.27 ± 0.54
6 months	Excision	45	1	0	0	0.02 ± 0.15

Note. Pain scale: 0=none, 1=mild, 2=moderate, 3=severe. POD = postoperative day; SD = standard deviation.

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Postoperative hypoesthesia decreased progressively in both groups and did not differ significantly at any assessment. At six months, hypoesthesia was documented in 5 of 44 patients (11.4%) after nerve preservation and 6 of 46 (13.0%) after nerve excision (P=0.808). The complete follow-up distribution is presented in Table 5.

Table 5: Incidence of postoperative hypoesthesia during follow-up

Follow-up	Preservation n=44, n (%)	Excision n=46, n (%)	P value
Postoperative day 1	29 (65.9)	27 (58.7)	0.480
1 month	14 (31.8)	17 (37.0)	0.608
3 months	9 (20.5)	10 (21.7)	0.881
6 months	5 (11.4)	6 (13.0)	0.808

Numbness likewise showed no significant between-group difference throughout follow-up. At one month, numbness occurred in 22.7% of the preservation group and 26.1% of the excision group; at six months, the proportions were nearly identical at 13.6% and 13.0% (P=0.934). Thus, the marked reduction in chronic groin pain after excision was not accompanied by a measurable excess of reported numbness during six months of observation (Table 6).

Table 6: Incidence of postoperative numbness during follow-up

Follow-up	Preservation n=44, n (%)	Excision n=46, n (%)	P value
Postoperative day 1	8 (18.2)	6 (13.0)	0.501
1 month	10 (22.7)	12 (26.1)	0.711
3 months	7 (15.9)	10 (21.7)	0.480
6 months	6 (13.6)	6 (13.0)	0.934

DISCUSSION

The present study found a clear mid-term pain advantage with elective ilioinguinal nerve excision during open Lichtenstein repair. Although the one-month incidence of neuralgia did not differ significantly, the separation between groups became pronounced at three months and persisted at six months. At the six-month visit, chronic groin pain was present in 22.7% of patients after nerve preservation compared with 2.2% after excision. Pain severity also declined more rapidly in the excision group, with almost all patients pain-free at six months. These findings support the hypothesis that planned division can reduce later neuropathic pain generated by traction, suture entrapment, mesh contact, or fibrotic incorporation of an intact nerve.

The direction and magnitude of the current findings are consistent with several previous studies. Dittrick et al. reported significantly less neuralgia after routine ilioinguinal nerve excision, without a significant long-term rise in paresthesia [9]. Mui et al. demonstrated lower six-month chronic groin pain after prophylactic neurectomy in a double-blind randomized trial, with no significant difference in numbness, sensory loss, or quality-of-life outcomes [10]. Malekpour et al. similarly reported less chronic inguinodynia after nerve excision [11]. In contrast, Picchio et al. found no meaningful long-term pain difference after elective division in a large randomized study [8], while the small pilot trial by Ravichandran et al. did not establish a pain benefit [7]. These divergent results indicate that operative technique, nerve identification, follow-up duration, pain definitions, and patient selection influence observed effects.

Contemporary evidence syntheses place these results in a balanced context. A meta-analysis by Barazanchi et al. found reduced short- and mid-term pain with neurectomy but no statistically secure long-term advantage beyond 12 months [13]. Cirocchi et al. likewise reported significantly lower pain at six months after neurectomy, without a significant increase in paresthesia, while the 12-month benefit was uncertain [14]. Importantly, the present study also found no significant differences in hypoesthesia or numbness at any time point. This sensory profile is clinically relevant because prophylactic division is often opposed on the assumption that intentional denervation necessarily produces troublesome sensory morbidity.

These results should not be interpreted as establishing routine neurectomy as a universal standard. International guidance emphasizes meticulous identification of inguinal

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nerves and favors a nerve-aware, individualized strategy, including pragmatic resection when a nerve is injured or is at high risk of mesh-related interference [1,2,4,12]. The baseline imbalance in hernia laterality, 10% attrition, strong male predominance, and six-month follow-up also temper causal interpretation. Nevertheless, the substantial reduction in pain observed after elective division, together with similar sensory outcomes, supports further adequately powered comparative trials with standardized CPIP definitions, blinded outcome assessment, and follow-up beyond one year.

Generalizability

The findings are most applicable to adults with uncomplicated inguinal hernia undergoing open Lichtenstein polypropylene mesh repair in tertiary-care surgical settings with similar perioperative practice. External applicability is narrower for women because 88 of 90 analyzed participants were men. The results also do not directly extend to patients with diabetes, recurrent or complicated hernias, previous groin surgery, laparoscopic or robotic repairs, or follow-up beyond six months. Multicentre validation across broader patient groups is therefore important.

Conclusion

Elective division of the ilioinguinal nerve during open Lichtenstein mesh repair was associated with a marked reduction in postoperative groin neuralgia at three and six months compared with nerve preservation. The six-month incidence of pain was 2.2% after excision versus 22.7% after preservation, while pain severity also declined more rapidly in the excision group. Importantly, hypoesthesia and numbness were similar between groups throughout follow-up, indicating no detectable increase in short- to mid-term sensory morbidity. These findings support elective neurectomy as a reasonable option in carefully selected patients, provided the nerve is clearly identified, and the expected benefits and sensory consequences are discussed before surgery. In routine surgical practice.

Limitations

This single-centre study included a relatively modest sample and had a 10% loss to follow-up, with postoperative outcomes assessed only up to six months. Women were markedly underrepresented, which may limit the generalizability of the findings. The two groups also differed in hernia laterality at baseline. The study did not incorporate quantitative sensory threshold testing, diagnostic nerve blocks, standardized quality-of-life instruments, or detailed assessment of iliohypogastric and genitofemoral nerve management.

Recommendations

Surgeons performing open Lichtenstein repair should deliberately identify the ilioinguinal nerve and document the nerve-management strategy. Elective division can be considered when the nerve is exposed to substantial traction, suture entrapment, mesh interference, or when a prophylactic approach is chosen after informed discussion. Patients should receive counselling regarding chronic postoperative inguinal pain and possible sensory change. Future studies should use concealed allocation, blinded outcome assessment, standardized CPIP definitions, validated quality-of-life instruments, quantitative sensory testing, and follow-up of at least 12–24 months. Large multicentre cohorts should also include more women, recurrent hernias, and diverse operative settings to clarify long-term benefit and safety.

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Abbreviations

BOO, bladder outlet obstruction; CPIP, chronic postoperative inguinal pain; IEC, Institutional Ethics Committee; IIN, ilioinguinal nerve; KGH, King George Hospital; POD, postoperative day; SD, standard deviation; SPSS, Statistical Package for the Social Sciences; VRS, verbal rating scale.

Conflict of interest

The authors declare no conflict of interest.

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This study received no funding.

Data availability

De-identified data supporting the findings of this study are available from the corresponding author on reasonable request, subject to institutional and ethics requirements.

Author contributions

Dr. Sadiya Semaub: Contributed to study conception and design, patient recruitment, data collection, literature review, data interpretation, and preparation of the initial manuscript draft.

Dr. A. Shivakumar: Contributed to study design, methodology, clinical supervision, interpretation of

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findings, and critical revision of the manuscript for important intellectual content.

Dr. ADV Lavanya: Contributed to conceptualization of the study, methodology, supervision, validation of the findings, interpretation of results, and critical revision of the manuscript.

Author biographies

Dr. Sadiya Semaub is a Postgraduate Student in the Department of General Surgery, King George Hospital, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India. Her academic interests include general surgery, hernia surgery, perioperative outcomes, and clinical surgical research.

Dr. A. Shivakumar is an Assistant Professor in the Department of General Surgery, King George Hospital, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India. His academic and clinical interests include general surgery, abdominal wall and hernia surgery, surgical education, and outcomes-based clinical research.

Dr. ADV Lavanya is an Assistant Professor in the Department of General Surgery, King George Hospital, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India. Her areas of interest include general surgery, inguinal hernia management, postoperative outcomes, surgical teaching, and clinical research. She serves as the corresponding author for the present study.

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