

## A SYSTEMIC REVIEW OF META ANALYSIS OF DIFFERENT STUDIES OF DRAINAGE IN ABDOMINAL SURGERY

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DOI: [10.5281/zenodo.10016326](https://doi.org/10.5281/zenodo.10016326)

### Abstract

**Background:** Surgeons are often faced with the decision of whether or not to drain the peritoneal cavity after intra abdominal surgeries. Drainage removes collected blood, pus, bile or any fluid helping in postoperative good recovery but is associated with unwanted pain, infections etc leading to more morbidity. Drains are often nonfunctional if not placed in proper cavity or recess, or displaced due to change in anatomical positions due to presence of intestinal loops & omentum or gets blocked by thick collection or may be expelled due to loosening of externally fixed tie knot. So many surgeons argue that such intra abdominal drain does not help. So the benefit of using a prophylactic drain after intra abdominal surgeries is still controversial. **Objective:** of this systemic review of Meta analysis Studies of drainage in Abdominal Surgeries is to derive a conclusion for using prophylactic drainage in abdominal surgeries. **Methods:** A systemic review of different Meta analysis studies on Surgical prophylactic drainage in abdominal gastrointestinal surgeries published from March 2011 till Feb 2023 in websites of Cochrane Database of Systematic Reviews, Medline, Pubmed, Scopus and EMBASE is being done. A manual search on health net web sites of search engine Google & WHO on this topic was undertaken. In these studies, primary outcomes as abscess formation, wound infection, mortality and re-operation as well as secondary outcomes as hospital stay, morbidity, quality of life and pain were assessed as a comparative study of 02 groups of patients one using intra abdominal drainage and another without drainage in different abdominal surgeries. **Result:** In this systemic review, 16 metaanalysis studies on intra abdominal drainage in abdominal surgeries has been included. Drainage did not improve outcomes after gastrointestinal surgeries such as distal pancreatectomy, appendectomy, liver resection, laparoscopic cholecystectomy, colorectal anastomoses, or anterior rectal resections etc. Rather, routine drainage caused harm to patients undergoing elective hepatectomy, laparoscopic cholecystectomy for non-complicated benign gallbladder, open cholecystectomy, and gastrectomy for gastric cancer as pain & wound infection increased in the drainage group resulting in increased morbidity and more hospital stay. The evidence of using drains after kidney transplantation, Roux-en-Y gastric bypass, and uro-oncologic surgery was low to draw conclusion and for pancreatoduodenectomy, drainage was helpful. **Conclusions:** This systemic review of metaanalysis of different studies done in last 02 yrs reveal that prophylactic intra abdominal drainage does not improve post op complications except in operation as pancreatoduodenectomy, rather may cause increase morbidity due to pain, infections but we cannot reach to a definite conclusion as lack of quality of researches available on this topic. So it is always a Surgeon's choice to put a drainage or not after abdominal surgeries and further studies and reviews are needed for a conclusive guideline on this topic.

**Keywords:** Surgical Drainage, Intra Abdominal Surgeries, Gastro Intestinal Surgeries.

### INTRODUCTION

In Surgery, decision of putting drain after intra abdominal surgeries is being practiced since modern ancient times, Intra abdominal surgeries as resections of resection anastomosis or repairs are often associated with serosanguinous discharges, purulent fluids, intestinal contents, faecus or effusions as peritoneal, bile or pancreatic enzymes

etc ,that are detrimental to the body.Various devices as simple rubber or silicone or poly plastic made flat sheets or tubes or complicated whole system connective with device for creating negative pressure with or without pumps,which fall under the collective name “drains”, have been gradually designed, described, and used to evacuate unwanted fluids from the body [1].

From the days of Hippocrates,when various metal, bone, gauze or wick preparations and gauze combinations were used as means of passive drainage.Hippocrates used these himself(480-377 BC) as a wooden tube to drain the empyema [2].Theodor Billroth (1829–1894), opined that the use of prophylactic drainage after gastro-intestinal operations was beneficial. The famous 19th-century Scottish gynecologist Robert Lawson Tait wrote that “if in doubt, drain” [3,4]. More than 90% of surgeons have used drainage after cholecystectomy, has been published after a study in USA hospitals [5]. Now a days in era of modern surgery where different modalities of surgeires as open, laproscopic and Robotic surgeries are done, surgeons choose drainage using different types of drains to prevent postoperative morbidities and mortalities.So it is no doubt that surgeons prefer to use surgical driange after any major intrabdomal surgery.

But,metaanalysisid of many studies published recently put many factors palliate against the usage of a multipurpose drain.So, its usage continues to be a topic of contention,controversary and dilemma.However, every surgical literature clearly state that whenever any collection or chance of collection expected drianage should be practiced with proper wisdom & care.so every body welcomes drainage of unwanted collections.So nobody can directly say yes or no to precautionary drainage usage.Hence, quote of Tait<sup>1</sup> – Whenever there is doubt, the drain is to be put is an established fact.But we need a definite answer by review of metaanalysis of differrent studies on this topic.Drainage happens via gravitational pull and action of capillaries in surrounding tissue to pull fluid .A surgical fixation knot over abdominal outer wall is used to avoid displacement or pulling out of drain from abdominal cavities.So this process is seldom precautionary[5].Surgeons use precautionary drainage in abdominal surgical procedures after its plus points were shown by Sims.But many surgeons donot abide by Sim’s theory too[6].

Most surgeons still believe that drainage in abdominal surgeries detects any leakage or discharge as early problems at a fast rate thus providing an early option in helping improve post op recovery while as in recent studies,surgeons who were not in favour say that drain of the peritoneum is not possible. Hence, it is of no use,so it is fact that the concept of a precautionary drain is not on any database.Beside this,a concern has been raised to use a foreign body as a drain placing inside the sterile abdominal cavity, leading to infections by contamination resulting post op complications. thus, numerous clinical trial studies and systematic reviews have showed the ineffectiveness of routine use of prophylactic drain [7–8]. Despite all these above datas,most surgeons use drainage after abdominal surgeries adhering to the values of Tait.[2] However,there is a scarcity of the data regarding the importance of the use of drainage.Thus the value of drainage remains disputable.Therefore,we need a clinical and academic evaluation on this topic by a systemic review of meta-analysis of different studies conducted in last 02 yrs on this topic. Accordingly, we decided to conduct a systemic review of metanalysis of different studies where intra abdominal drainage was used in different types of abdominal surgeries.

## MATERIAL & METHODS

A Systemic Reviews of 16 different Meta analysis studies on surgical prophylactic drainage in abdominal gastrointestinal surgeries published in websites of Cochrane Database of Systematic Reviews, Medline, PubMed, Scopus & EMBASE during Mar 2011 till Feb 2023 is being done. No prospective or retrospective primary study was included in this study only review of published studies done.

The list of reference articles was retrieved and they were searched via automation & manually using keywords as like “intra abdominal surgeries”, “prophylactic abdominal drainage”, “wound infection,” “to drain or not to”, “intraperitoneal drainage”, “post-operative length of hospital stay”, “Surgical Site Infection (SSI) as wound infection ”or “Pain”. A manual search by looking at similar article for final accepted studies and their references is being done on health net websites of search engine Google scholar and WHO websites.

The title/abstract and full-text screening processes were conducted by two reviewers separately, and disagreements were resolved by a third reviewer as per recommendations of Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020) [9].

**Inclusion Criteria:** We included 1) Full text meta-analysis of observational studies that main focused on comparison groups as using or not using of intra abdominal or retro-peritoneal drainage after abdominal surgeries. 2) Most updated and comprehensive metaanalysis of different studies on different intra abdominal gastrointestinal surgeries done as randomized clinical trails 3) Most recent meta-analyses and the largest if multiple meta-analysis of the same gastrointestinal surgery published as analytical descriptive studies..

**Exclusion Criteria:** We excluded: 1) Non-systematic reviews and clinical practice guidelines. 2) Metaanalysis of studies comparing different types of drainage in abdominal surgeries. 3) Metaanalysis of studies comparing different subcutaneous drainage or drainage other than in the abdomen. 4) Metanalytical Studies published in languages other than English. Data for each eligible article was extracted by one of the authors, and reviewed by another.

Conflicts were resolved by discussion and the intervention of a third author. No specific date was predefined regarding publication. Automated & manual deduplication was performed. In these studies, primary outcomes as abscess formation, wound infection, mortality and re-operation as well as secondary outcomes as hospital stay, morbidity, quality of life, and pain were assessed while using drainage or without drainage in different abdominal surgeries.

We assessed the risk of bias and quality of the included studies by using two tools; AMSTAR-2 tool (A Measurement Tool to Assess systematic Reviews) which consists of 16 items to assess the quality of the studies [10]. And ROBIS (Risk Of Bias In Systematic reviews) tool which contained phases with four domains, and specific concerns about potential biases with the review are assessed by answering signaling questions in each domain by “yes”, “probably yes”, “no”, “probably no”, and “no information” [11]. All statistical analyses were performed using MetaXL software tool.

## RESULTS

For this systemic review, 16 final metaanalysis of studies of drainage in different intra abdominal surgeries from March 2011 till Feb 2023 were reviewed. Searching was done in four databases as manual search, screening title/abstract and full text. We applied our review on PRISMA guidelines. The fields of the accepted studies are No.1 Suction drainage in different surgeries [3] No. 2 Pancreatic Resection (Pancreaticoduodenectomy and Distal Pancreatectomy) for different reasons [8], No.3 Appendectomy (irrespective of open or laparoscopic) for complicated appendicitis [6], No.4 Major liver resection for different reasons [13], No.5 After laparoscopic cholecystectomy for acute cholecystitis [14], No.6 Elective hepatectomy [15], No.7 Liver resection and 1st & 3<sup>rd</sup> day drainage removal [23].

No.8 Laparoscopic cholecystectomy in patients with non-complicated benign gallbladder disease [16], No.9 Gastrectomy for gastric cancer [17], No.10 Colorectal anastomoses [18], No.11 Uro-oncologic surgery [19], No.12 Anterior resection of the rectum [20], No.13 Pelvic lymphadenectomy in women with gynaecological malignancies [21], No. 14 Roux-en-Y gastric bypass [22], and No. 15 Uncomplicated open cholecystectomy [7], No.16 The Kidney Transplantation [12] as shown in Table 1.

For gastro-intestinal surgeries, no study supported the routine use of the drain after surgery. Draining did not improve outcomes after distal pancreatectomy, appendectomy (irrespective of open or laparoscopic) for complicated appendicitis, major liver resection, laparoscopic cholecystectomy, colorectal anastomoses, and anterior rectal resections.

Otherwise, routine drainage seems to be harmful to patients undergoing elective hepatectomy, laparoscopic cholecystectomy for non complicated benign gallbladder, open cholecystectomy, and gastrectomy for gastric cancer. For pancreatic resection, the rates of haemorrhage, delayed gastric emptying and morbidity for the Low-risk subgroup for pancreatic fistula were higher in the drain group. But, for the High-risk subgroup for pancreatic fistula, the rate of haemorrhage was higher in the drain group while the rates of reoperation and morbidity were higher in the non-drain group. So, this review suggests that intraperitoneal drainage may be useful for some patients undergoing pancreaticoduodenectomy, especially for those with high risk for pancreatic fistula.

The use of retroperitoneal drain is not useful as it did not prevent lymphocyst formation after pelvic lymphadenectomy in women with gynecological malignancies. The evidence of using drain after kidney transplantation, Roux-en-Y gastric bypass, and uro-oncologic surgeries was very low and uncertain. However, drains can be advised in case of radical prostatectomy and partial nephrectomy.

But in radical cystectomy, there was not enough evidence to recommend the elimination of the drain. Abscess formation after surgery The results of postoperative abscess formation have been reported by only three studies (studies No.2, 3, 12) as separate outcome, and there was no significant difference between drain and non-drain group.

There was no significant difference for postoperative wound infection between the drainage and non-drainage groups after kidney transplantation, pancreatic resection, major liver resection, laparoscopic cholecystectomy for acute cholecystitis, anterior resection, and pelvic lymphadenectomy.

Otherwise, drainage group had higher incidence for wound infection after appendectomy for complicated appendicitis. & hepatectomy, laparoscopic cholecystectomy in patients with non-complicated benign gallbladder disease and an uncomplicated open cholecystectomy. There was no significant difference for mortality between the drainage and non-drainage groups, except mortality was higher in nondrainage group in pancreatic resection & anterior resection of the rectum and mortality was higher in drainage group in elective hepatectomy.

There was no significant difference for re-operation after elective hepatectomy, partial nephrectomy, anterior resection of the rectum, and uncomplicated open cholecystectomy. Otherwise, drainage group had higher rate for re-operation after gastrectomy for gastric cancer. The length of postoperative hospital stay was statistically greater in drainage group in studies No. 3, 4,5, 6, 7, 12, and 14. Except for pelvic lymphadenectomy (study No. 13); There was no significant difference for hospital stay between the In drainage and non-drainage groups .

The results of pain have been reported by only one study. Study No.7 analyze seven RCTs (each study measured the level of pain using a 10- point visual analog scale (VAS)) on the postoperative pain at 24h after laparoscopic cholecystectomy in patients with non-complicated benign gallbladder disease and showed more postoperative pain in drainage.

There was no significant difference for perirenal transplant fluid collection, lymphocele, hematoma, and wound dehiscence after kidney transplantation between the drainage and non-drainage groups. There was no significant difference for bile leak, haemorrhage, delayed gastric emptying, intra-abdominal abscess, and interventional radiology after pancreatic resection.

There was no significant difference between the drainage and non-drainage groups for anastomotic leakage after gastrectomy for gastric cancer, colorectal anastomoses, and anterior resection of the rectum respectively. Hospital costs or quality of life outcomes is same in both groups.

## DISCUSSION

Every intra abdominal surgeries of resection or resection anastomosis or repair is associated with probability of some discharge or leakage of blood, pus, or bile or faecal matter primarily or secondarily serosanguinous fluid with or without pus after hrs to days resulting from infections or other factors. So Surgeons are often faced with the decision of whether or not to drain the peritoneal cavity and mostly submit to this dilemma by putting a drain by using simple sheets or tubes or a whole system. So Drainage systems may be open or closed as passive using low negative pressure or as active with high pressure gradient.

Most Surgeons put a drain in intra abdominal surgeries as colorectal, gastro intestinal anastomosis, resection of Liver, Stomach, Pancreas, colon, gut etc or repair of any perforation or trauma. This drainage help exudate which may be blood, pus, bile or to

flow out of the abdominal cavities rather than allowing it to accumulate, to avoid anastomotic dehiscence and infection.

Thus haemorrhage, infection & anastomotic leakage are diagnosed early via prophylactic placement of drain, But this Systemic review of these studies shows that the usage of drains in abdominal surgeries specifically clean-cut surgeries does not have any medical advantages to support drainage in abdominal surgeries. Even these placed drains are often blocked by such discharges soon resulting in no benefit and rather causing more pain, infection hampering recovery.

Abdominal Drainage system either used as open or as in closed tube with or without device of establishing negative pressure using with or without pumps or system often becomes nonfunctional as displaced due to change in anatomical positions due to presence of intestinal loops & omentum or get blocked by thick collection or may get expelled out due to loosening of externally fixed tie knot or undue pressure resulting it's pull out from patient during postoperative period .

A drain should always be brought out from a different incision than the main one as the drain may infect the main wound thus becoming a source of infection of the abdominal cavity and even after that these studies establish that it too is source of infection. So such drain can lead to drain site infection, persistent drain site pain resulting in more stay in hospital.

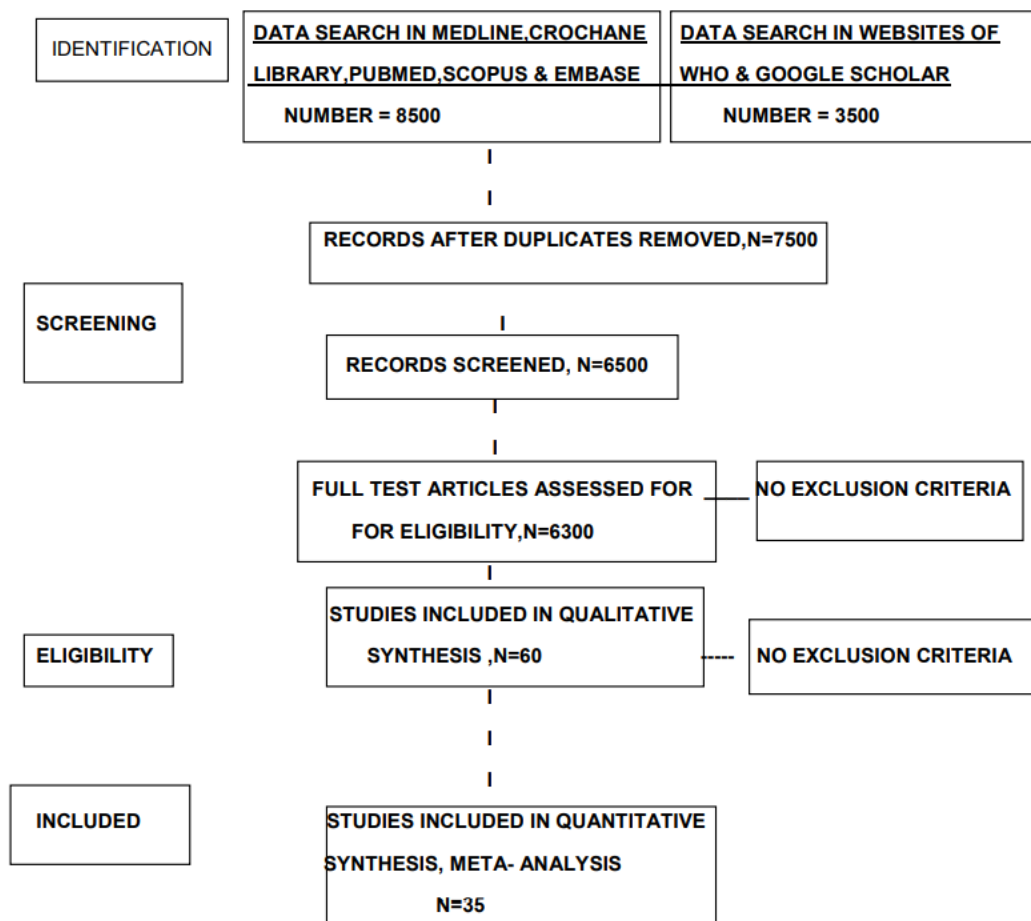
Due to these patient become psychotic and show unwillingness for an oral diet with the drain in situ, lack of willingness / effort & fear among patient / relatives to mobilise because of the drain in place which furthermore prolongs the post-operative recovery period resulting long hospital stay among patients with drains. Beside Drain site may be a place of incisional hernia if placed long a fistula tract may also form surrounding the drain site.

However, some of the accepted studies in our review indicated that there may be some benefits from using drainage, such as in patients with a high risk of developing fistulas and undergoing pancreatectomy with duodenectomy as in Whipple's operation.. Another review suggested the use of the drain may be useful in radical prostatectomy, splenectomy and partial nephrectomy too.. It can detect anatomical leak, haemorrhage, so surgeons fear for such complications are nil after usage of draining in abdominal surgeries and that is why most surgeons always believe in using it even knowing it may cause infection, pain or long hospital stay.

But scientifically, this systemic review shows that drains are not useful and even may cause more infections, pain & other morbidities.. So available evidence indicates that surgeons should avoid routine use of the drain. But there is limitation of this systemic review too, so to better understanding of the benefits of prophylactic drainage, we need more randomized control trials or experimental or observational studies of good quality, in particular, triple blind randomized controlled trials, to derive a clear cut outcome suggesting when and where and for how much days, drain can be placed in few special surgeries only without causing any post op morbidity as shown in this systemic review ensuring good post op recovery..

**Table 1 : Meta Nalysis Studies Details ( MARCH 2100 TILL FEB 2013)**

Seri No.	Last name, year	No. of studies	Study Designs	s.designs Types	Pts with Drain	Pts without Drain	Total Pts	RT/CRT Quality	Observation Quality
1	Jayalakshmi BK et al.2023	04	Observation	04 Observatio	212	202	414	-----	4 Moderate Risk
2	Liu et al., 2021	15	Obser/rct	04RCT/11 observation	19044	4504	24077	Bias in 4 rct	8 high 3 low quality
3	Dezfouli et al., 2021	08	Rct/non rct	03rct/05 non rct	2670	2380	5050	Bias in 3 rct	4 intermed 1 low qualit
4	Zawistowski et al., 2021	05	observational	P5 observation	1072	1022	2094	-----	3mod,1serious ,1 crtic
5	Liu et al., 2021	05	Rct/quasi rct	4rct/02 quasi RCT	262	259	521	3 bias, 3 low risk	-----
6	Anweiler et al., 2021	12	RCT/ case control	3crt,8 case control	3084	2642	5726	1 bias,8 no clear risk	03 high quality
7	Ichida et al.2020	06	observational	06 obser vational	224	212	436	-----	02 low risk 04 mod risk
8	Yang et al., 2020	21	RCTs	21 RCTs	1666	1580	3246	7high 14 low qual	-----
9	Weindelmayer et al., 2020	10	Rct/ cohort	3RCT 7cohort	2054	1173	3227	3 good quality	07 good quality
10	Cirocchi et al., 2020	07	RCT/observational	4RCTs,1pro,2 Retro observation	618	656	1274	3low,1 high	3 high risk
11	Kowalewski et al. .2019	11	rct,pros,retro cohort	4rct,6 retro,1 pros cohort	1334	1330	3664	4 high risk	1 low risk
12	Cavaliere et al., 2019	05	Rcts control clinical	03 Rcts 02 control clinical trial	1206	496	1702	2poor 1fair rct cct fair	-----
13	Padda et al., 2019	04	RCT	4RCTs	556	554	1110	3low,1 unclear	-----
14	Charoenkwan et al., 2017	04	RCTs	4RCTs	288	283	571	3 mod 1 high qua	-----
15	Liscia et al., 2014	18	cohort	6 pros 12 retro cohort	N/M	N/M	16455	-----	12 mod 06 low risk
16	Gurusamy et al., 2011	28	RCTs	28 RCTs	N/M	N/M	3659	17 high 11 unclear	



**Figure 1: Prisma Flow Diagram For The Study**

**Table 2: Result of Surgeires With Drains Of Metaanalytic Studies**

Type of Surgery	Severity of Pain	Wound Infection	Hospital Stay	Benefit
Pancreatico Duodenectomy	Mild	Absent	Normal	Helpful
Distal Pancreatectomy	Severe	Present	Prolonged	Not Helpful
Liver resection	severe	Present	Prolonged	Not helpful
Hepatectomy	Severe	Present	Prolonged	Not Helpful
Gastrectomy for Gastric CA	Severe	Present	Prolonged	Not helpful
Appendectomy	Mild	present	Prolonged	Not Helpful
Open Cholecystectomy	Moderate	Present	Prolonged	Not helpful
Laposcopic cholecystectomy	Mild	Present	Prolonged	Not helpful
Anterior Rectal Resection	Moderate	Present	Prolonged	Not helpful
Splenectomy	Mild	Absent	Normal	Helpful
Radical Prostectomy	Mild	Absent	Normal	Helpful
Partial Nephrectomy	Mild	Absent	Normal	Helpful
Gastro Intestinal Anastomosis	Moderate	present	Prolonged	Borderline
Uro Oncological Surgeries	Severe	Present	Prolonged	Not helpful
Kidney Transplant Surgery	Moderate	Present	Prolonged	Borderline



## CONCLUSIONS

This systemic review of Meta analysis of 16 studies from March 2011 till feb 2103 of putting prophylactic or precautionary drain in different abdominal surgeries establish that such drains are not helpful to reduce post op morbidities but cause more complications as pain & infections leding to more hospital stay. Blockage, misplacement or pull out of such drainage is another concern where no benefit rather harm is caused to patient. But many surgeons still very comfortable to put drain in major to moderate resection anastomosis or resection or repair surgeries to be on safe side by detecting early leak, haemorrhage, discharge, pus, bile, faecus etc. Expulsion of such fluids from operation sites or from abdominal cavity by drain as passive or active by creating negative pressure gradient, result in good postop recovery. However, as shown in this above review, available literature does not indicate its advantage but does not have sufficient evidence to deny the use of drain as three way blinded randomized clinical trials are lacking. Therefore, in spite of various articles and studies in this systemic analysis backing the theory that that usage of drains does not help in post op recovery and may deteriorate it by pain, infection etc, drain placement in abdominal surgeries should be on operative surgery to surgery basis or intra-operative basis only till triple blind randomised clinical trials provide us a clear cut guideline.

**Acknowledgements:** Nil

**Sources of Funding :** Nil

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