Archives of Surgical Research | Meta-analysis

To Drain or Not to Drain in Thyroidectomy: A Meta-analysis of Outcomes

Safia Zahir Ahmed; Zaitoon Zafar; Talat Waseem; Faisal Rafiq

IMPORTANCE There is a traditional belief that a drain placed after thyroid surgery can prevent life-threatening hemorrhage and a hematoma from forming.

OBJECTIVE We conducted a meta-analysis to review the outcomes of a drain placement versus no drain placement following thyroid surgeries.

DESIGN This is a meta-analysis

DATA SOURCES Data was extracted using the Medical subject heading and key words "Drainage", "Thyroid", "Thyroidectomy", "subtotal thyroidectomy" "Goitre" and "Thyroid cancer" in PubMed Central, Embase, Pubmed, Cochrane library, Central Register of controlled Clinical Trials, ICTRP, CINAHL and Google Scholar. Further articles were identified by following the authors and references cited in the selected studies.

METHODS Randomized controlled trials and comparative studies monitoring patients who underwent thyroidectomy, subtotal thyroidectomy, and thyroidectomy with neck dissection for malignancy and lobectomy and isthmectomy for benign nodular goiter, with documentation of drain or no drain placement were included in the study. Single arm trials, cohort studies, retrospective studies, drains placed following parathyroid surgery were excluded. Qualitative studies of randomized controlled trials were reviewed using the Cochrane collaboration scheme on RevMan 5.4. Meta-analysis was assessed with odd ratio and standard mean difference using fixed effect model. The primary outcomes analyses were post-operative complications, re-operation rates, post-operative pain and length of hospital stay.

RESULTS We found 27 randomized controlled trials with 3297 patients, 1671 had drain placements and no drain was placed in 1626 patients. The odd ratio of wound infection was 2.9%(95% CI 1.6% to 5.3%), hematoma was 1% (95% CI 0.6% to 1.7%), seroma was 0.8% (95% CI 0.5% to 1.4%), hemorrhage was 1.5%(95% CI 0.7% to 3.4%), re-operation was 1.6% (95% CI 0.8% to 3.2%), hypocalcaemia was 1.7% (95% CI 1.2% to 2.5%), postoperative pain was 1.2%(95% CI 1% to 1.3%) and length of stay was 0.9% (95% CI 0.8% to 1%).

CONCLUSION There is significant difference in post-operative complications, incidence of post-operative pain and length of hospital stay in patients who have drain placement compared to those with no drain placement. However, seroma formation is observed more frequently in patients who have no drain placed after thyroid surgery.

KEYWORDS Drainage, Thyroidectomy, Subtotal thyroidectomy, Lobectomy, Goiter, Thyroid Cancer, Drain placement

HOW TO CITE Ahmed SZ, Zafar Z, Waseem T, Rafiq F. To Drain or Not to Drain in Thyroidectomy: A Meta-analysis of Outcomes. *Archives of Surgical Research*. 2020;1(3):6-17. https://doi.org/10.48111/2020.03.03

Meta-analysis

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https://doi.org/10.48111/2020.03.03

Many controversies exist regarding drain placement following a thyroidectomy[1]. Most believe that placing a drain after a thyroid surgery can prevent a life-threatening haemorrhage[2]. Early detection of airway compromise can highlight an early bleed from the thyroid bed through drain output[3]. To conquer the fear of bleeding after thyroid surgery, surgeons take comfort with the routine placement of a drain[4,5,6,7]. The incidence of bleeding after subtotal thyroidectomy is almost 0.3 % to 1% as there is vascularized tissue left behind after surgery which tends to bleed[8-9]. Although with good hemostasis the chances of bleeding are lowered.

The occurrence of a surgical wound following a thyroidectomy, and the resultant evacuation of the hematoma and seroma fluid collection from a confined space is another factor to be considered[10]. Authors have argued that a drain reduces the intensity of airway obstruction from a hematoma with the risk of a hematoma formation requiring a reoperation being around 0-2.6% [8,11,12,13] and 0-1.5%[2,14,15,16]. A hematoma occurs around 2-4 hours after surgery and can lead to potential life-threatening complications with 75% of complications occurring within 6 hours of surgery[6,7,16,17].

Some studies have shown that a drain can assist in recognition of hematoma to some extent but cannot prevent the risk of it's development[18]. Most studies contradict this claim, stating that a drain could potentially get blocked by clotted blood and conceal the signaling of major bleeding, delaying surgical intervention[19].

There is evidence in different surgical specialties regarding drain insertion which points to drain placements no longer being recommended[20,21]. Some studies even claim drain placement increases the incidence misdiagnosed, but despite the clinical trials that have been undertaken over the years to show the lack of benefits of a drain placement after thyroid surgery, most surgeons still use routine drain placements after thyroid surgery[22,23,24].

One of the studies exploring a focused clinician group with discussions and conducting a thematic analysis found that a drain placement is owed more to the surgeon's apprehension and school of training rather than to evidence-based practice[25]. Moreover, most studies have documented that a drain increases the likelihood of a wound infection, postoperative pain, discomfort, and even increases the length of stay and chances of a cosmetic scar[26]. Tian et al. conducted a meta-analysis regarding the drain versus no drain debate following a thyroidectomy, but the study had limitations; increase heterogeneity in the length of hospital stay and differences in types of drains, diagnosis and general conditions of the patient. The outcomes of re-operations were not evaluated in patients who developed a hematoma[27].

We aim to conduct this meta-analysis in order to compare the outcome of drain placement versus no drain placement after a thyroid surgery. We plan to achieve a well-found conclusion by including high quality prospective clinical trials that have been conducted over the years, with a large population size, and review the post-operative outcomes along with the complications encountered, to enforce and compound the evidence provided in the previous meta-analyses available.

METHODS:

Search strategy and inclusion:

A Literature search was conducted using the Medical Subject Heading and Free Key words such as "Drainage", "Thyroid", Subtotal thyroidectomy". Thyroidectomy", "Goitre" and "Thyroid cancer" in the Pubmed, Pubmed Central, Embase, Cochrane Library, Central Register of Controlled Clinical Trials, ICTRP, CINAHL and Google Scholar database to identify studies and articles from January 1986 to July 2020. The data was further expanded from the authors and studies, references of the authors were followed and data was identified. Data was extracted using Boolean Operators method. Language barriers were overcome to include relevant data.

Eligibility:

All randomized prospective clinical trials documenting drain or no drain placement following a thyroid surgery were included in the study. The studies in which total thyroidectomy, subtotal thyroidectomy, lobectomy and isthmectomy for benign disease and total thyroidectomy with neck dissection for thyroid cancers which reported quantitative variables were included. Single arm studies, cohort studies, studies on cumulative thyroid and parathyroid drainage, retrospective studies, editor letters, reviewers, case series, abstract without full articles identified were excluded from the studies.

Study Selection and Outcome:

After fulfilling the selection criteria of the studies, two arm prospective clinical trial were selected. Thyroid surgery due to benign and malignant thyroid disease were included. The primary outcomes measured were the postoperative complications, re-operation incidence, post-operative pain, and length of hospital stay. The post-operative complications reviewed were wound infection, hematoma, seroma, hemorrhage, and hypocalcaemia. The outcomes measured were quantitative variables.

Data Extraction:

The data selected and identified was reviewed in adherence with Preferred Reporting Items of Systematic Review and Meta-analysis (PRISMA) guidelines28. Two authors reviewed the articles and screened the data after the comprehensive database search. Further data was explored by a third author for any discrepancy and further discussion was done. Abstract authors were contacted through email to retrieve full articles. Duplicate studies were excluded and excluded studies were reviewed by the third author and reconfirmed regarding the decision. Included studies were reviewed and in case of doubt, were further explored. The quality of the randomized controlled trials (RCTs) was reviewed using Cochrane collaboration risk of bias assessment tool29. The selection bias was assessed with random sequence generation and allocation concealment, reporting bias with selective reporting, performance bias with blinding the participants and personnel, detection bias with blinding outcome and attrition bias with incomplete outcome data. Studies scoring five or above were considered high-quality.

Statistical Analysis:

Analysis was performed on all selected studies after review and discussion. The events of post-operative complication that included wound infection, seroma, hematoma, hemorrhage, hypocalcaemia, and re-operation were assessed using dichotomous variables of drain placement versus no drain placement after thyroid surgery. The Dichotomous variables was calculated using odd ratio with Mantel-Haenszel method with 95% confidence interval. The post-operative outcome of post-operative pain and length of hospital stay was calculated using continuous variable with 95% CI in drain versus no drain placement after thyroid

surgery and assessed with inverse variance method with effect measure of standard mean difference. Studies in which mean and standard deviations were, not found, mean and variances were calculated using the range, size and median of the study. Fixed effect method was used for the assessing the dichotomous and continuous variables and the heterogeneity of the population if less than 50% and if more than 50%, random effect model was selected for each outcome. The data was quantified and calculated using 2x2 chi square test in Rev Man 5.4 Software for the metanalysis.

The pooled results of the events of the intervention were shown in Forrest plot. The sensitive analysis of the study was individually analyzed by excluding the study to review its effect on the pooled results. Cochrane Q test was used to assess the heterogeneity of the population and I2 test was used for statistical analysis for the assessment of heterogeneity across the studies. The heterogeneity of individual study and extent of the publication bias was assessed using funnel plot. The degree of heterogeneity was assessed as not important (0-40%), moderate (30-60%), substantial (50-90%) and considerable (75-100%).

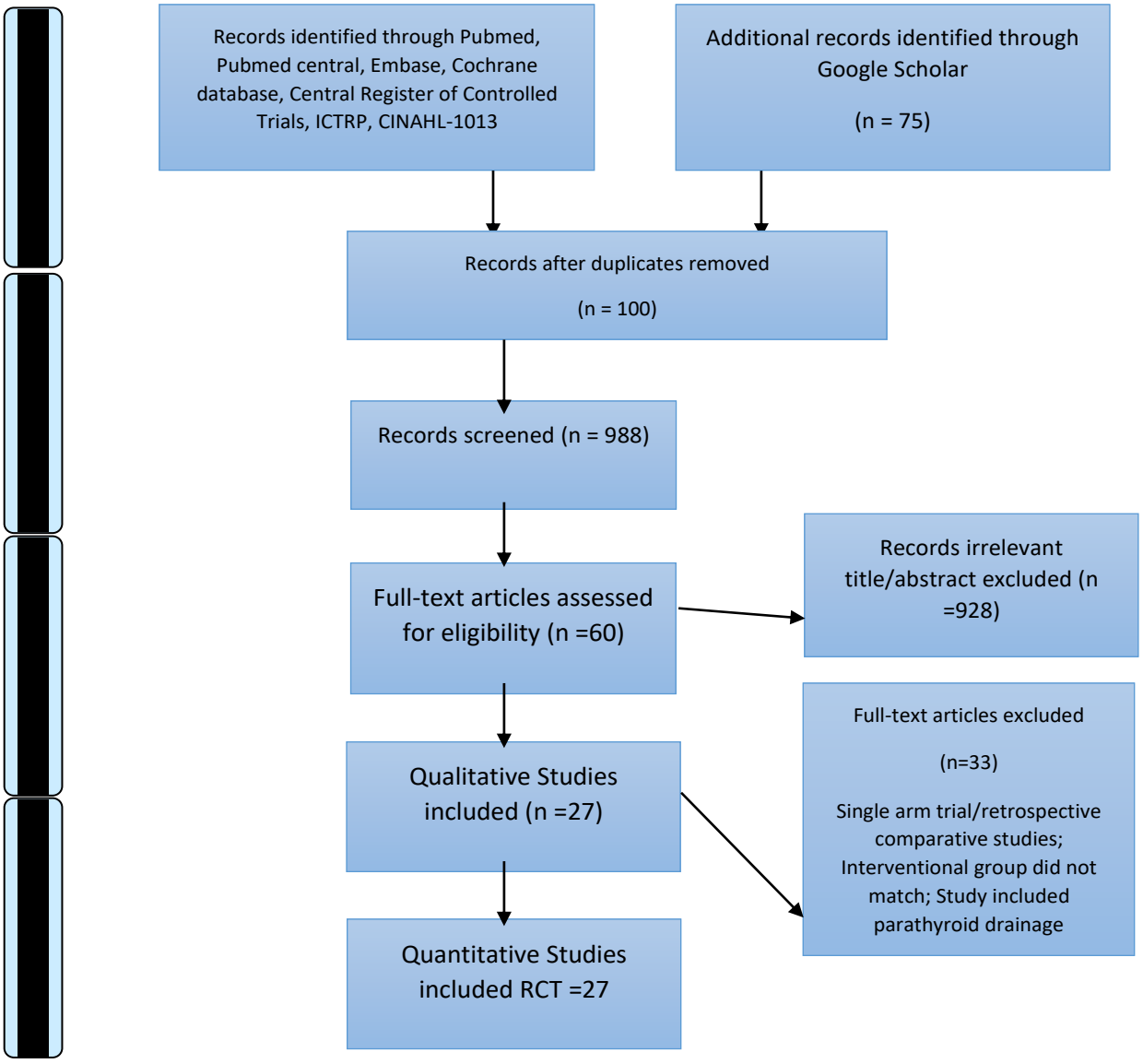

Fig 1. Flow chart showing a selection of studies using PRISMA diagram

RESULTS:

After extensive search with Boolean Operator method, 1088 studies were found and 60 were selected according to eligibility criteria, after excluding other irrelevant articles and full text articles were reviewed. 27 articles[6,7,8,15,23,25,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49] fulfilled the

inclusion criteria of the selection process after a detailed review. The PRISMA selection flow chart is shown in Fig 1. The articles excluded from the study were retrospective comparative study, included thyroid and parathyroid surgery to review the drainage, compared open and suction drainage and had no quantitative data of outcome.

The 27 selected articles were randomized prospective controlled trials with characteristics of the study is shown in Fig 2. All the studies operated on benign and malignant thyroid disease which required a total thyroidectomy, subtotal thyroidectomy, or lobectomy and isthmectomy. Thyroid cancer requiring extensive dissection and requiring neck dissection, huge toxic goiter and retrosternal goiter were excluded. In contrast, Lee et al. operated on total thyroidectomy with central neck dissection and Papavramidis et al. included patients with huge thyroid gland and total thyroidectomy and excluded small volume thyroid gland.

	Drain Placement				No Drain Placement				
Authors	No. of Pts	TT(%)	Type of Drain	Mean Age	No. Of Pts	TT(%)	Mean Age	Inclusion Criteria	Exclusion Criteria
Deveci 2013	200	86	Suction Drain	43	200	82	47	TT, TL for BD	SSE, ND, CD
Kalemera 2013	34	9	NA	45	34	0	44	All thyroid surgery	CD, Advanced TC,
Neary 2012	49	27	Open Drain	53	44	20	51	All thyroid surgery	Sternotomy, ND, CD
Musa 2010	35	100	Suction Drain	50	25	100	52	All thyroid surgery for BD	Intrathoracic extension, ND
Colak 2008	58	100	Suction Drain	45	58	100	47	All thyroid surgery for BD	ND, CD
Morrissey 2008	23	48	Suction Drain	NA	32	41	NA	TT, HT, CT	CD, ND, huge Goitre
Lee 2006	101	28	Suction Drain	50	97	19	45	All thyroid surgery, CND	SSE, GD, LND, CD
Suslu 2006	68	46	Suction Drain	47	67	43	47	All thyroid surgery	ME, CD, ND
Khanna 2005	51	NA	Suction Drain	35	51	NA	35	All thyroid surgery	CD, ND
Hurtado-Lopez 2000	100	8	Suction/Open	39	50	18	39	All thyroid surgery	ND
Debry 1999	43	42	Suction Drain	48	57	32	48	All thyroid surgery for BD	ND
Schoretsanitis 1998	100	84	Suction Drain	52	100	96	52	All thyroid surgery	NA
Wihlborg 1988	75	13	Suction Drain	48	75	15	48	All thyroid surgery	ND, Sternotomy
Peix 1992	48	NA	Suction Drain	NA	49	NA	NA	Cold Nodule,Euthyroid, TL	ND, Previous NS
Tubergen 2001	52	NA	Suction Drain	NA	48	NA	NA	All Euthyroid surgery	ND
Pezzullo 2001	30	NA	Suction Drain	NA	30	NA	NA	All thyroid surgery	Previous NS, Irradiation, ND
Dimov 2006	43	NA	Suction Drain	NA	57	NA	NA	All thyroid surgery	ND
Ishaq 2008	30	NA	Suction Drain	39.2	30	NA	39.2	All thyroid surgery	CD, GD, ND
Muthaa 2013	45	29	Suction Drain	44.6	45	25	40.7	TT, TL for BD	ND
Chalya 2011	32	NA	Suction Drain	48.5	30	NA	48.5	All thyroid surgery for BD	large goiter, CD, ND
Memon 2012	30	NA	Suction Drain	32.2	30	NA	31.2	TL	TT, STT, Previous NS, ND
Papavramidis 2014	50	50	Suction Drain	47	50	50	51	TT	GD, ND, CD, Previous NS
Waseem 2020	112	21	Suction Drain	49.3	100	13	47.3	All thyroid surgery	Large goitre, CD, ND, sternotomy
Jefferson 2014	32	20	Passive Drain	44.7	34	9	43.7	All thyroid Surgery	CD, Extensive TC, ND, ME
Abaszadeh 2017	90	NA	Closed Drain	41.3	90	NA	41.5	TT, STT, TL for BD and TC	CD, ND, SSE
Nawaz 2015	32	NA	Suction Drain	42.4	36	NA	42	All thyroid surgery	CD, ND, SSE, Advanced TC
Schietroma 2017	108	74	Suction Drain	47.2	107	76	48.3	All thyroid surgery	ND, ME

Fig 2: showing characteristics of the studies included in the studies. TT-Total Thyroidectomy, TL-Total Lobectomy, STT-Subtotal thyroidectomy, BD-Benign Disease, TC- Thyroid cancer, ND-Neck Dissection, SEE-Substernal extension, ME-Mediastinal Extension, CD-Coagulation Disorders, GD-Graves' Disease, NS- Neck surgery, LND-Lateral neck dissection, NA- Not applicable.

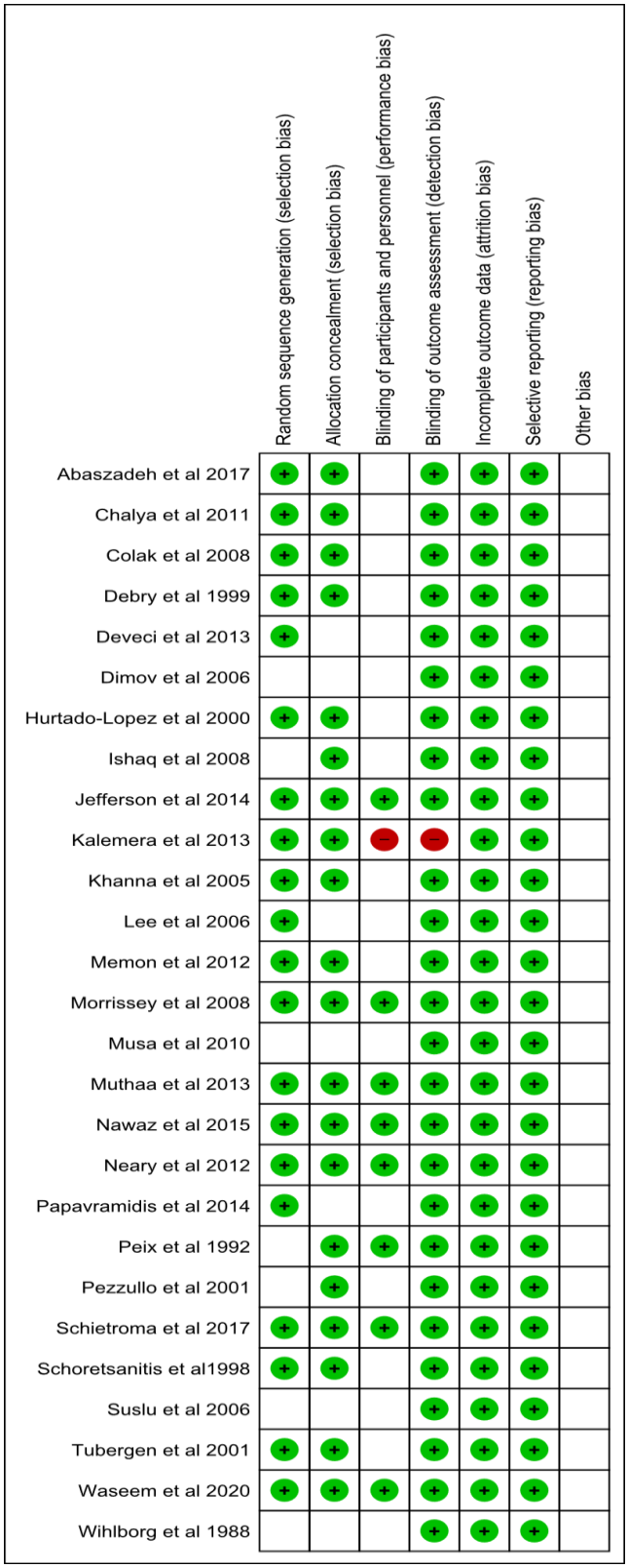

Fig 3. Cochrane risk of Bias Assessment tool conducted on included studies of the meta-analysis.

The post-operative wound infection was monitored in all studies except for 7, seroma formation was not monitored in 10 studies, the presence of a hematoma was mentioned in all of the studies except for 7, and 10 studies did not mention whether the patients developed hemorrhage, and 3 studies did not mention whether the patients were taken back to theatres for re-operation. Hypocalcaemia was monitored in 14 studies. Post-operative pain score was not monitored in most of the studies except in 10 and only 3 studies failed to mention the length of the hospital stay post operatively.

The quality of the studies was reviewed using the Cochrane risk of bias assessment tool and found high quality studies with low risk of bias as shown in Fig 3. Most of the studies scored was 5 and above for each section.

A total of 3297 patients were included in the study, 1671 patients had drain in place while 1626 did not have any drain placed after thyroid surgery.

Post-operative wound infection was assessed in 20 RCT studies. Pooled results of odd ratio using Mantel Haenszel Fixed effect method was almost 3% in 2537 patients detected wound infection. It is noted that patients who had drain placed were prone to wound infection than no drain group. 40 patients out of 1267 developed wound infection in drain group in contrast 11 patient out of 1270 in no drain group with overall P value of 0.0003. There was no difference in heterogeneity of the individual study results when excluded individual studies.

Post-operative hematoma complication was observed in 2712 patient in 20 studies. In Drain group ,33 patient out of 1385 versus 29 patients in 1327 in non-drain group developed hematoma with pooled result of odd ratio of 1% (95% CI 0.6% to 1%). This showed there was no gross difference between both the groups and favoring more of no drain group.

Out of 1868 patients from 17 studies, post-operative hemorrhage occurred in 13 patients out of 933 having drain placement, compared to 7 out of 935 with a pooled result of odd ratio fixed effect of 1% favoring no drain group. Patients who were taken back to theatres due to a hemorrhage and/or hematoma were 28 out of 2837 from 24 RCT studies. 18 patients out of 1435 were from drain group compared to 10 patients out of 1402 who did not have any drain placement. The pooled results of odd ratio were 1% with P value 0.17 with no difference in heterogeneity in the studies.

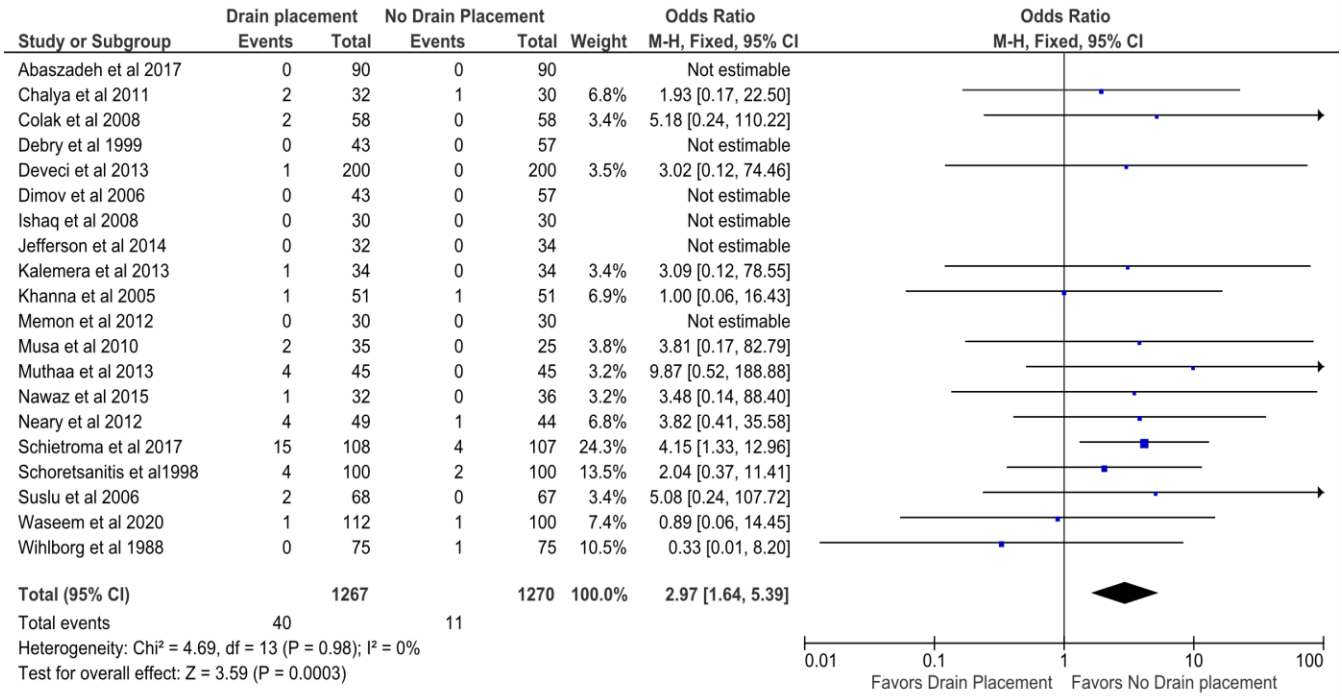

Fig 4: Forest plot showing wound infection in drain versus no drain placement with pool results of almost 3% (95% CI 1% to 5%) favoring no drain placement.

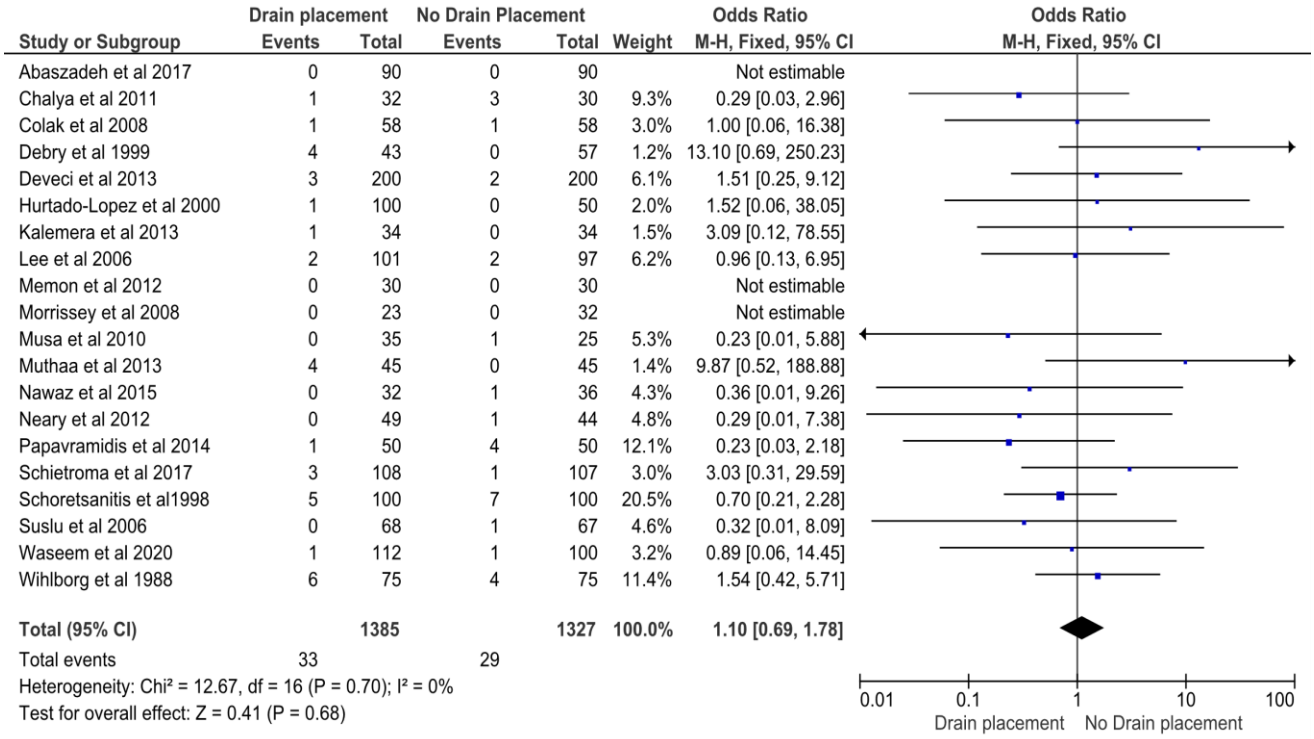

Fig 5: Forest Plot showing hematoma formation in drain versus no drain placement favoring more of no drain placement with a narrow angle.

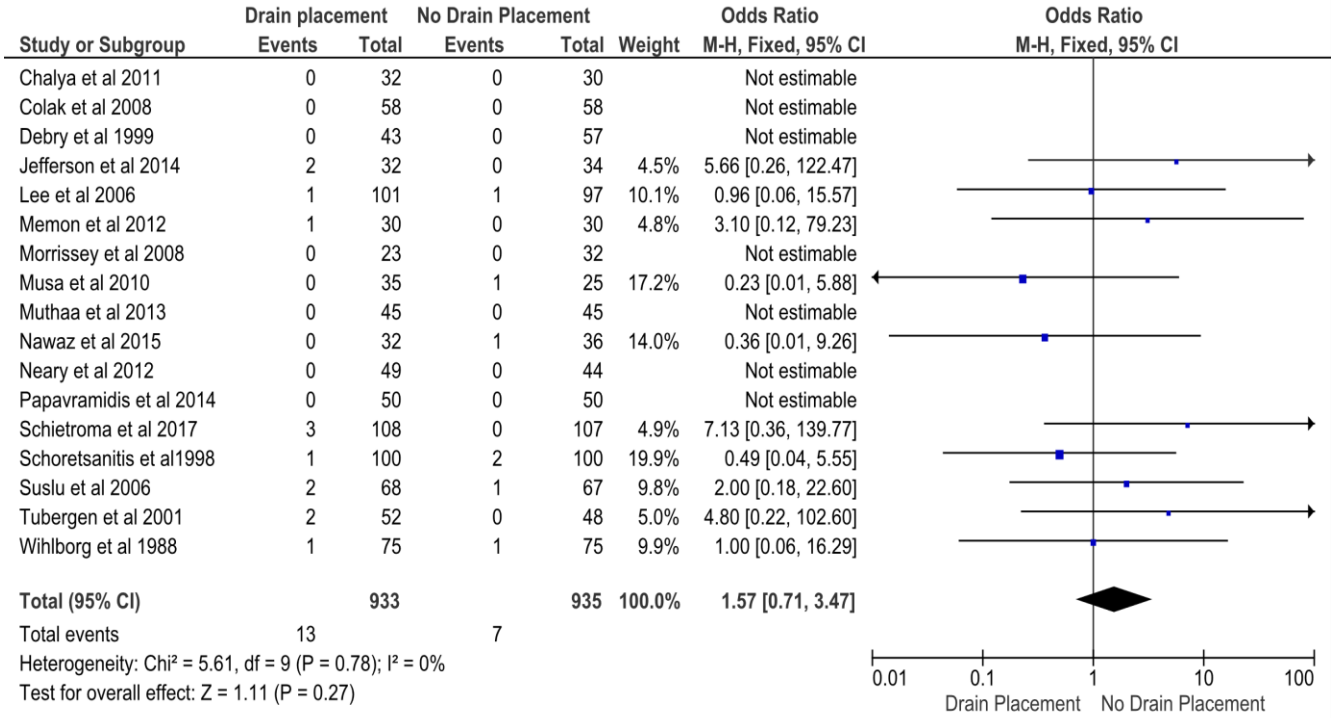

Fig 6: Forest Plot showing in Post-operative hemorrhage in drain placement compared to no drain placed with 1% pooled result (95%CI 0.7% to 3%)

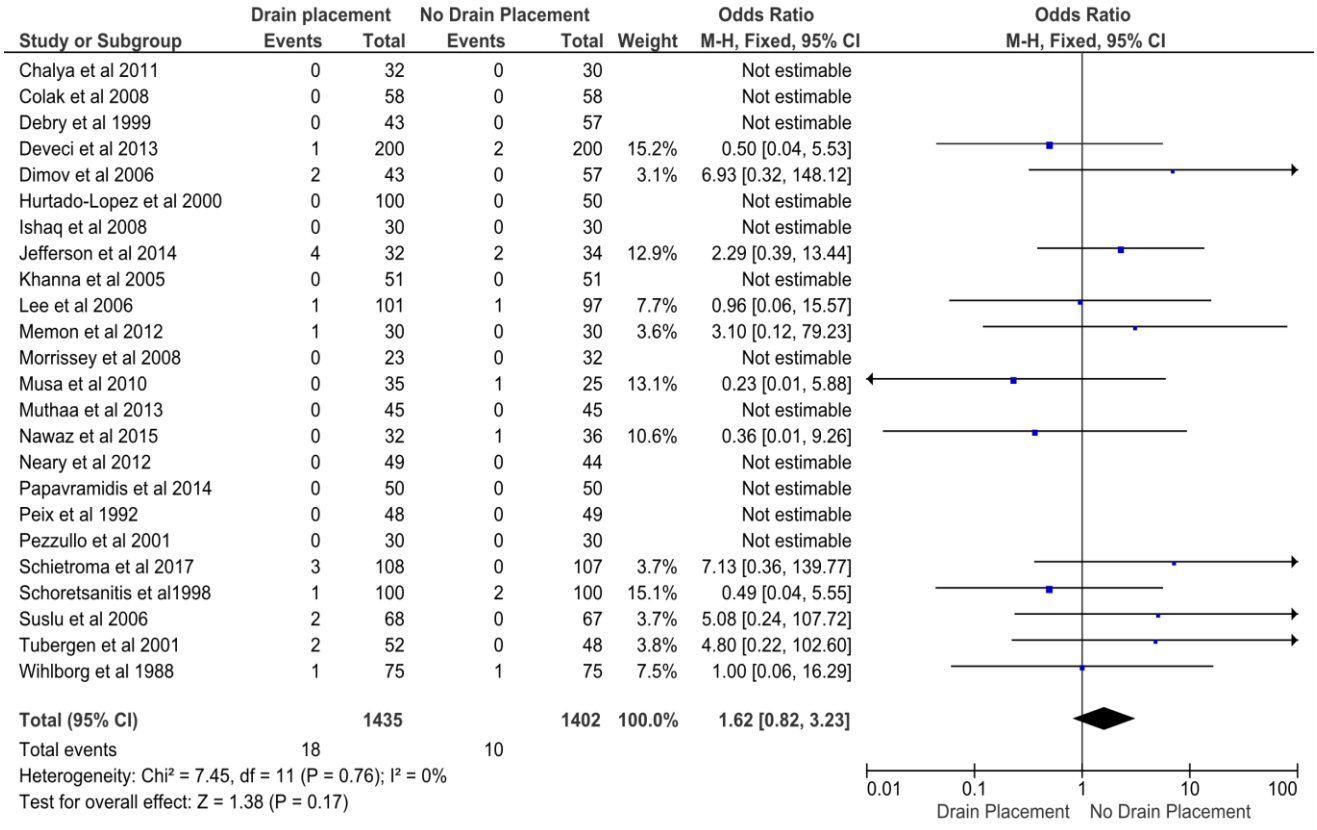

Fig 7. Forest Plot in patient who underwent re-operation in drain versus no drain placement showing 1% (0.8% to 3%) favoring no drain placement.

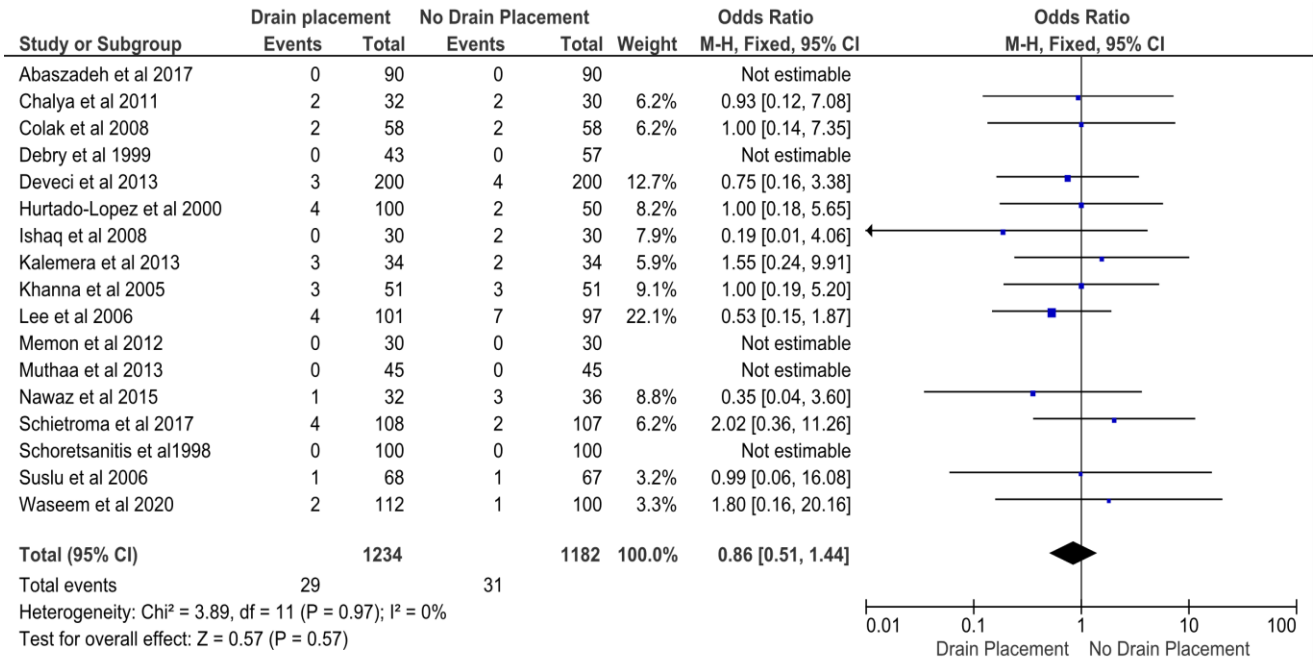

Fig 8: Forest Plot of seroma formation in drain placement group compared to no drain group showing 0.8% (95% CI 0.5% to 1%) favoring drain placement

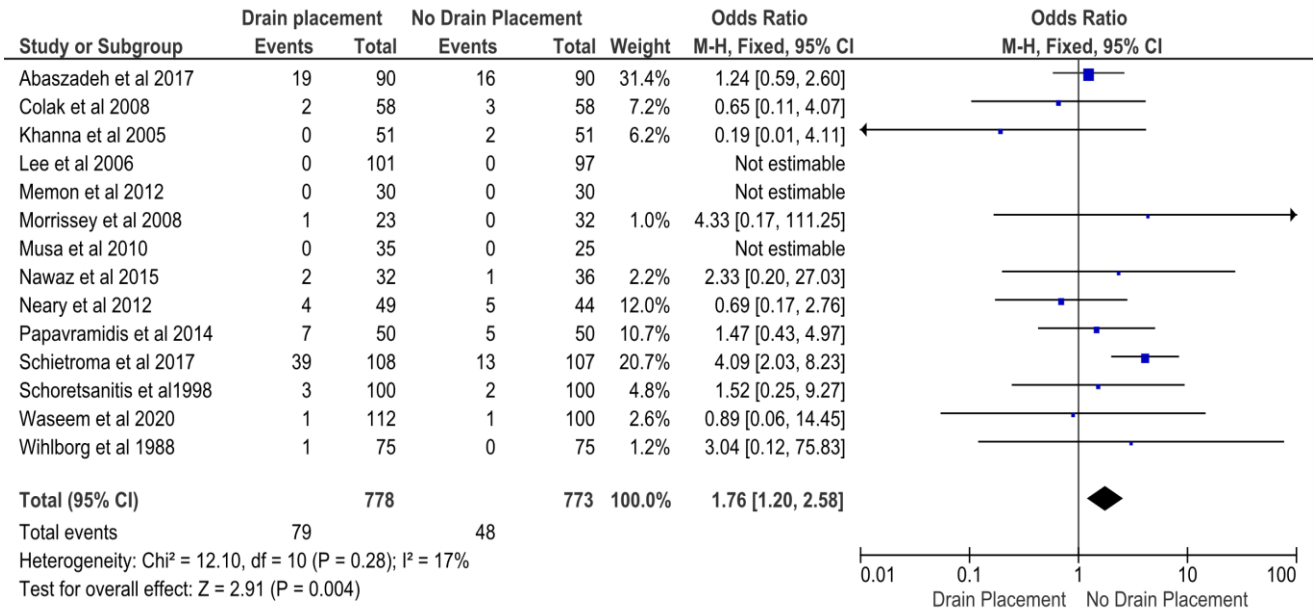

Fig 9: Forest plot of occurrence of hypocalcaemia in drain group compared to no drain placement with OR of 1% favoring no drain placement group

Study or Subgroup	Drain Placement Mean	SD	Total	No Drain placement Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Chalya et al 2011	2.4	1.4	32	1.4	0.5	30	8.8%	0.93 [0.40, 1.45]
Colak et al 2008	2.6	1	58	1.9	0.6	58	9.5%	0.84 [0.46, 1.22]
Deveci et al 2013	3	0.7	200	2	0.7	200	10.0%	1.43 [1.21, 1.65]
Kalemera et al 2013	5.7	2.3	34	2.5	2.2	34	8.7%	1.41 [0.87, 1.94]
Memon et al 2012	6.2	1	30	2.6	1.6	30	7.8%	2.66 [1.96, 3.37]
Muthaa et al 2013	7	2.2	45	3.6	1.5	45	8.9%	1.79 [1.30, 2.28]
Nawaz et al 2015	60.8	7	32	41.1	4.1	36	7.5%	3.45 [2.68, 4.21]
Neary et al 2012	2.9	0	49	3	0	44		Not estimable
Papavramidis et al 2014	1.5	1.6	50	1.6	1.5	50	9.4%	-0.06 [-0.46, 0.33]
Schietroma et al 2017	5.7	1.2	108	4.3	1.3	107	9.8%	1.12 [0.83, 1.40]
Schoretsanitis et al1998	6.1	1.2	100	3.5	1.6	100	9.7%	1.83 [1.50, 2.16]
Waseem et al 2020	3.1	1.1	112	2.3	0.4	100	9.8%	0.94 [0.66, 1.23]
Total (95% CI)			**850**			**834**	**100.0%**	**1.43 [1.03, 1.83]**

Heterogeneity: Tau² = 0.41; Chi² = 120.73, df = 10 (P < 0.00001); I² = 92%
Test for overall effect: Z = 6.98 (P < 0.00001)

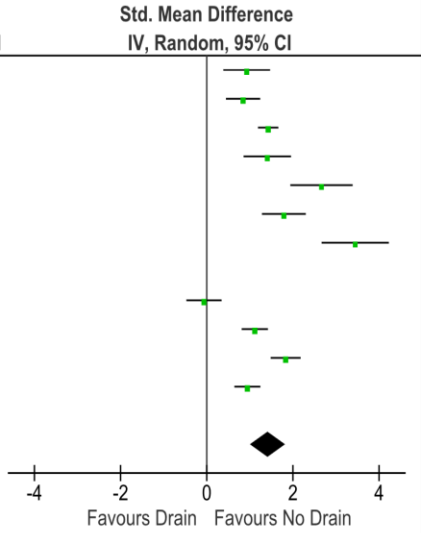

Fig 10: Forest Plot for postoperative pain in Drain placement group compared to no drain placement showing standard mean difference of inverse variance random effect pooled result of 1% (95% CI 1% to 1%).

Study or Subgroup	Drain placement Mean	SD	Total	No Drain Placement Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Abaszadeh et al 2017	2.3	0.6	90	2.1	0.8	90	4.9%	0.28 [-0.01, 0.58]
Chalya et al 2011	7.4	0.1	32	4.6	1.2	30	4.3%	3.30 [2.52, 4.08]
Colak et al 2008	2.4	0.7	58	1.6	0.6	58	4.8%	1.22 [0.82, 1.62]
Debry et al 1999	2	0	43	1.7	0	57		Not estimable
Deveci et al 2013	1.5	0.8	200	1.1	0.3	200	5.0%	0.66 [0.46, 0.86]
Dimov et al 2006	2	2.1	43	1.8	2	57	4.8%	0.10 [-0.30, 0.49]
Hurtado-Lopez et al 2000	2.7	1.2	100	2	0.9	50	4.9%	0.63 [0.28, 0.97]
Ishaq et al 2008	0	0	30	0	0	30		Not estimable
Jefferson et al 2014	3.1	0.9	32	2.5	0.8	34	4.7%	0.70 [0.20, 1.20]
Kalemera et al 2013	2.4	0.8	34	1.7	0.7	34	4.7%	0.92 [0.42, 1.42]
Khanna et al 2005	4.3	2.3	51	3	1.7	51	4.8%	0.64 [0.24, 1.04]
Lee et al 2006	9.3	4.6	101	6.8	1.4	97	4.9%	0.73 [0.44, 1.01]
Memon et al 2012	3.3	0.6	30	2.1	0.3	30	4.4%	2.50 [1.81, 3.18]
Morrissey et al 2008	2	0.9	23	0.8	0.4	32	4.5%	1.80 [1.16, 2.44]
Musa et al 2010	4.8	1.3	35	1.6	0.7	25	4.3%	2.89 [2.15, 3.63]
Muthaa et al 2013	3.2	0.12	45	1.2	0.06	45	1.3%	20.90 [17.75, 24.05]
Nawaz et al 2015	3.6	0.7	32	1.1	0.4	36	4.1%	4.40 [3.50, 5.30]
Neary et al 2012	2.3	0	49	2.1	0	44		Not estimable
Peix et al 1992	3.8	1.06	48	3.2	1.33	49	4.8%	0.49 [0.09, 0.90]
Pezzullo et al 2001	5.9	2.4	30	4.7	1.9	30	4.7%	0.55 [0.03, 1.06]
Schietroma et al 2017	3.8	1.2	108	2.5	0.8	107	4.9%	1.27 [0.98, 1.56]
Schoretsanitis et al1998	3.4	0.6	100	1.6	0.5	100	4.8%	3.25 [2.82, 3.67]
Suslu et al 2006	2.6	1	68	1.3	0.7	67	4.8%	1.50 [1.11, 1.88]
Tubergen et al 2001	4.56	1.09	52	3.88	1.33	48	4.8%	0.56 [0.16, 0.96]
Waseem et al 2020	25.9	9.8	112	21.8	3.5	100	4.9%	0.54 [0.27, 0.82]
Total (95% CI)			**1516**			**1471**	**100.0%**	**1.59 [1.17, 2.01]**

Heterogeneity: Tau² = 0.92; Chi² = 499.07, df = 21 (P < 0.00001); I² = 96%
Test for overall effect: Z = 7.39 (P < 0.00001)

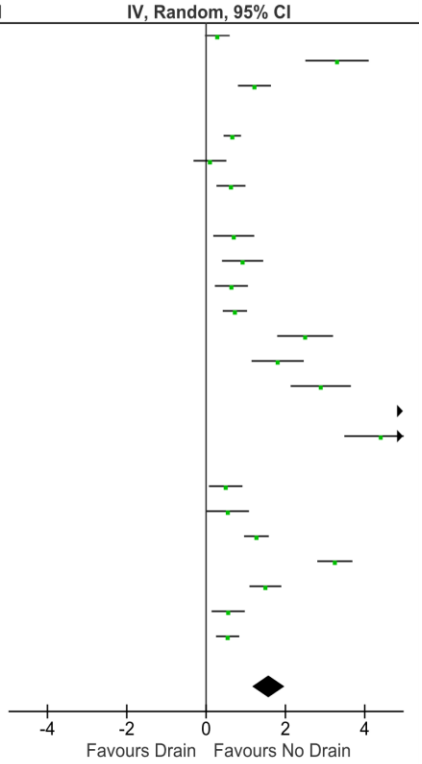

Fig11: Forest plot of length of stay in drain placement group compared to no drain placed showing pooled result of standard mean difference of random effect 1% (95% CI 1% to 2%) favoring no drain placement.

DISCUSSION:

It is an open debate whether routine drain placement has advantage after thyroid surgery. Endocrine surgeons argue that it can prevent from life threatening complications and airway obstruction. Evidence shows that a drain placed after a thyroidectomy offers no benefit in a patient's post-operative outcomes in uncomplicated cases. But still, surgeons hesitate to close the wound without placing a drain[50]. Our meta-analysis directs towards no difference in both the groups with the exception of a longer length of hospital stay in drain placement groups[27]. Due to a small sample size of the studies in the previous meta-analysis, we chose to conduct ours on a large population size to

overcome previous limitations. We evaluate postoperative outcomes and the efficacy of drain placements in postoperative period, pain management and length of hospital stay to see any difference from the previous reported results.

Our meta-analysis study excludes parathyroid surgery in contrast to previous meta-analyses to avoid bias, as there is less extensive dissection in parathyroid surgery. Recently, more compulsive hemostatic agents, surgical techniques and innovative technologies have pushed the practice of surgery toward a safer, more preventive approach with fewer postoperative complications. There was no difference noted in seroma and hematoma formation in both the groups but number of patients who underwent exploration in hematoma was higher in drain group than non-drain group. Out of 18 patients belonging placement drain group, underwent re-operation in which 5 cases developed hematoma while others experienced life-threatening hemorrhage. Moreover, 10 patients from no drain placement group had exploration done, out of which 3 had hematoma formation. This shows that in case of routine drainage, the practice remains ineffective in preventing hematoma formation, however it can prevent a seroma from forming and reduces the dead space of the wound. It still needs to be explored whether patients have re-operation in late or acute phase hematoma formation.

All the studies excluded neck dissection, toxic goiter and retrosternal dissection but Lee et al. conducted a study on 198 total thyroidectomy patients with central neck dissection and reviewed that no routine drain placement is a safe and effective approach with beneficial postoperative outcome and a reduction in hospital stay. However, central neck dissection along with total thyroidectomy, which is up to level VI lymph nodes and does not require extensive dissection or creation of large amount of dead space. Li and Chen[13] did a meta-analysis on total thyroidectomy with neck dissection and proved no difference between the two groups but due to limited study the results remain uncertain. Similarly, Shaha et al[2] study proved that most patients developed hematoma in drain group which shows that regardless of a drain placement, postoperative outcomes cannot be prevented and routine drain placement adds no advantage to the recovery of the patient. As proved in this meta-analysis with no significant difference in the outcomes. Patients with drain placement were more prone to wound infection, hypocalcaemia, increased post-operative pain and increase in length of hospital stay and the study data favors no routine drainage after a thyroidectomy for better patient outcomes[32,51]. Waseem et al. did a thematic analysis to explore the surgeon's belief and concerns regarding the routine drain placement and formulated a decision tree regarding their decisions. He found out that the operating surgeons placed the drain in for their own peace of mind rather than to avoid a hemorrhage. As it shows that drains cannot prevent an expanding hematoma, and the decision to explore the wound for immediate release is the only management[25].

Moreover, drain placement can increase the chances of bacteria translocation and in turn, a wound infection[52]. A few studies have compared a suction drain with an open passive drain to detect merits, but when analyzing the data there was no marked difference in the heterogeneity of postoperative wound infection in the drain groups[10]. As the fear of contamination in regards to hemorrhage is acceptable by the surgeons.

On the issue of practical expertise, most surgeons have practiced the same techniques and routine drain placement but the fear instilled in them forces them to place a routine drain in uncomplicated thyroidectomy rather than to follow evidence-based practise[4,6,7,].

Tian et al. did a meta-analysis on 14 studies and found the post-operative wound infection and length of stay was greater in drain placement group with no significant difference in hematoma or seroma formation. Our study comprises of 27 prospective trials with 3297 participants with 1671 in drain group and 1627 in non-drain group showing that postoperative outcomes are better in no drain group when compared. There was no difference in the seroma formation between the group although the hemorrhage in 17 studies and hematoma development in 20 studies results reviewed were more inclined towards no drain procedure in uncomplicated surgery with less incidence rate of complication.

The sensitive analysis of the study proves that the results are reliable and comparable with the proven literature. This study aids surgeons in their decision making and in changing the trend of practice as there is no additional advantage of a drain placement.

Few authors advocate that draining the thyroidectomy with extensive dissection such as huge goiter, combination of neck dissection and in retrosternal goiter or patients on anticoagulant as they are more vascular and tend to bleed but there is no evidence that drains can prevent the torrential bleed. It may aid in detecting early major arterial bleed which can be managed in a timely fashion[12,13,53].
Although our study advocates no drain placement in uncomplicated thyroidectomies but the study has its limitations. As our study shows, wound infection is associated with drain placement but it needs to be further explored and open versus closed suction drains need to be compared. There were limited studies in which open drains were used so the results remain ambiguous and any change in the result is uncertain. To achieve a comparable study a larger sample size study is required in open passive drain to reach a conclusion. Further study needs to be explored regarding the thyroid surgery if drains are beneficial in lateral neck dissections, grave's disease, huge goiter, or thyroid cancers involving the strap muscles.

CONCLUSION:

Based on our meta-analysis, our results are comparable with the existing literature and updated evidence provide similar

results that placing drain does not make a difference in postoperative outcomes yet increases the chances of wound infection, postoperative pain and length of hospital stay and no change in decision making of re-exploration of the wound after thyroid surgery. The practice of drain placement is based purely on a surgeon's experience, training, and comfort level rather than on evidence-based practice with no additional benefit and a change in practice should be encouraged.

ARTICLE INFORMATION

Accepted for Publication: April 26, 2020. Published Online: Sept 30, 2020. https://doi.org/10.48111/2020.03.03

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Financial Support and Sponsorship: Nil.

Conflicts of Interest: There are no conflicts of interest

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