



Sleeve gastrectomy and sleeve-plus procedures: A network meta-analysis on weight and metabolic outcomes.

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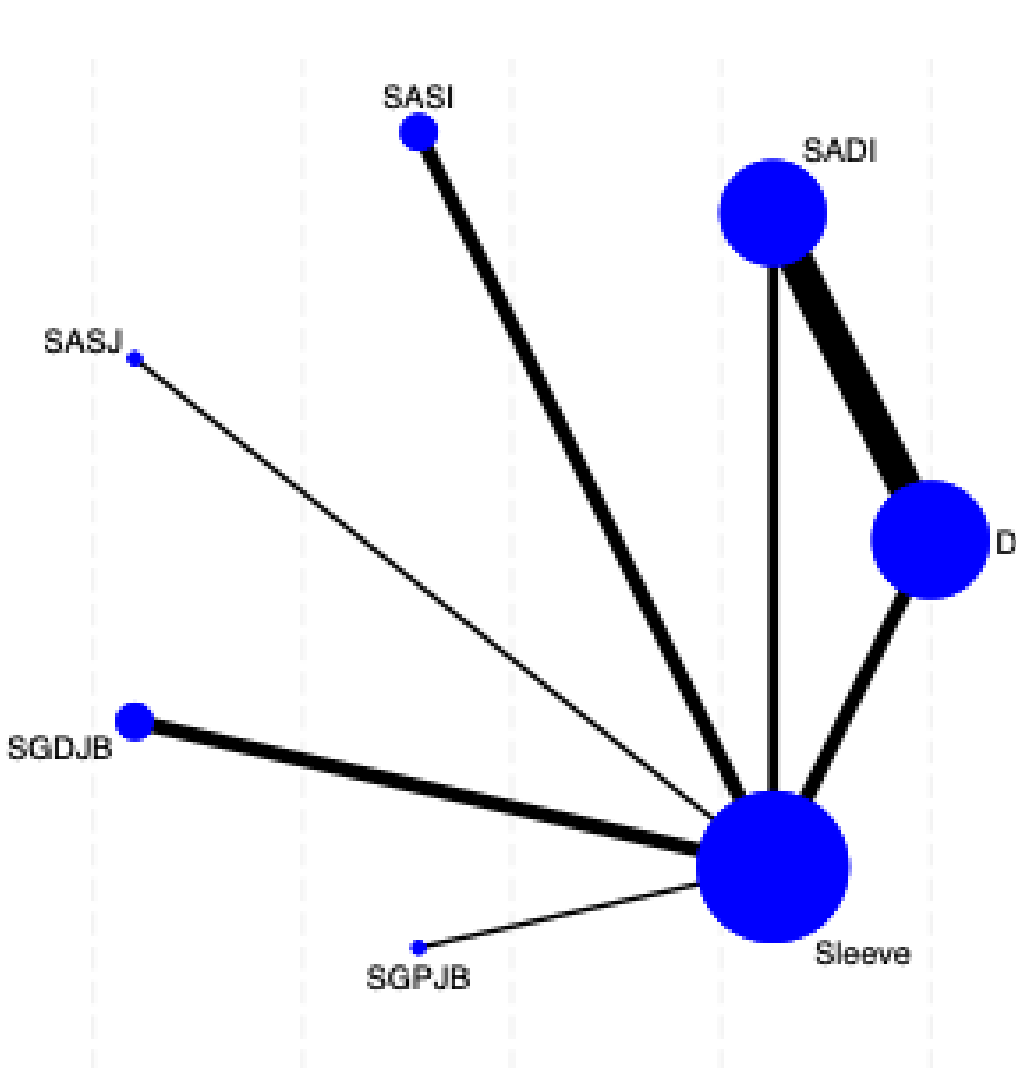
Background

Sleeve gastrectomy (SG) is the most commonly performed procedure worldwide, but several modified “sleeve-plus” techniques may provide additional benefits. This network meta-analysis (NMA) aimed to compare SG with its variations regarding weight loss and diabetes improvement.

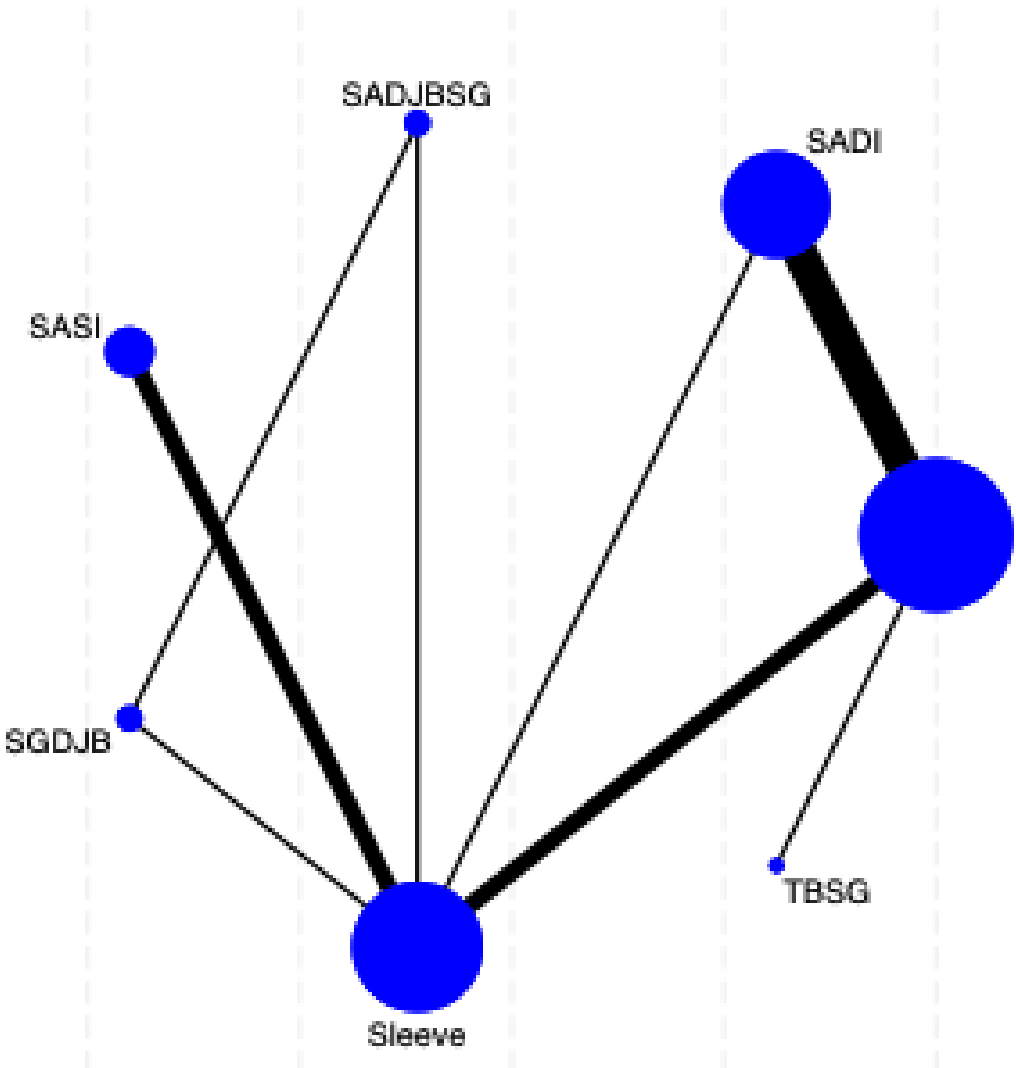
Method

Scopus and Medline were systematically searched, and eligible studies were screened independently by two reviewers. Studies comparing SG with sleeve-plus procedures and reporting percent excess weight loss (EWL), total body weight loss (TBWL), or diabetes outcomes were included. Data were extracted and pooled using a random-effects multivariate NMA. Effect sizes were summarized as mean difference (MD) for EWL/TBWL and risk ratio (RR) for diabetes improvement, with 95% confidence intervals (CIs). Treatments were ranked using the surface under the cumulative ranking curve (SUCRA). Consistency was assessed via global inconsistency testing, and publication bias was evaluated with comparison-adjusted funnel plots.

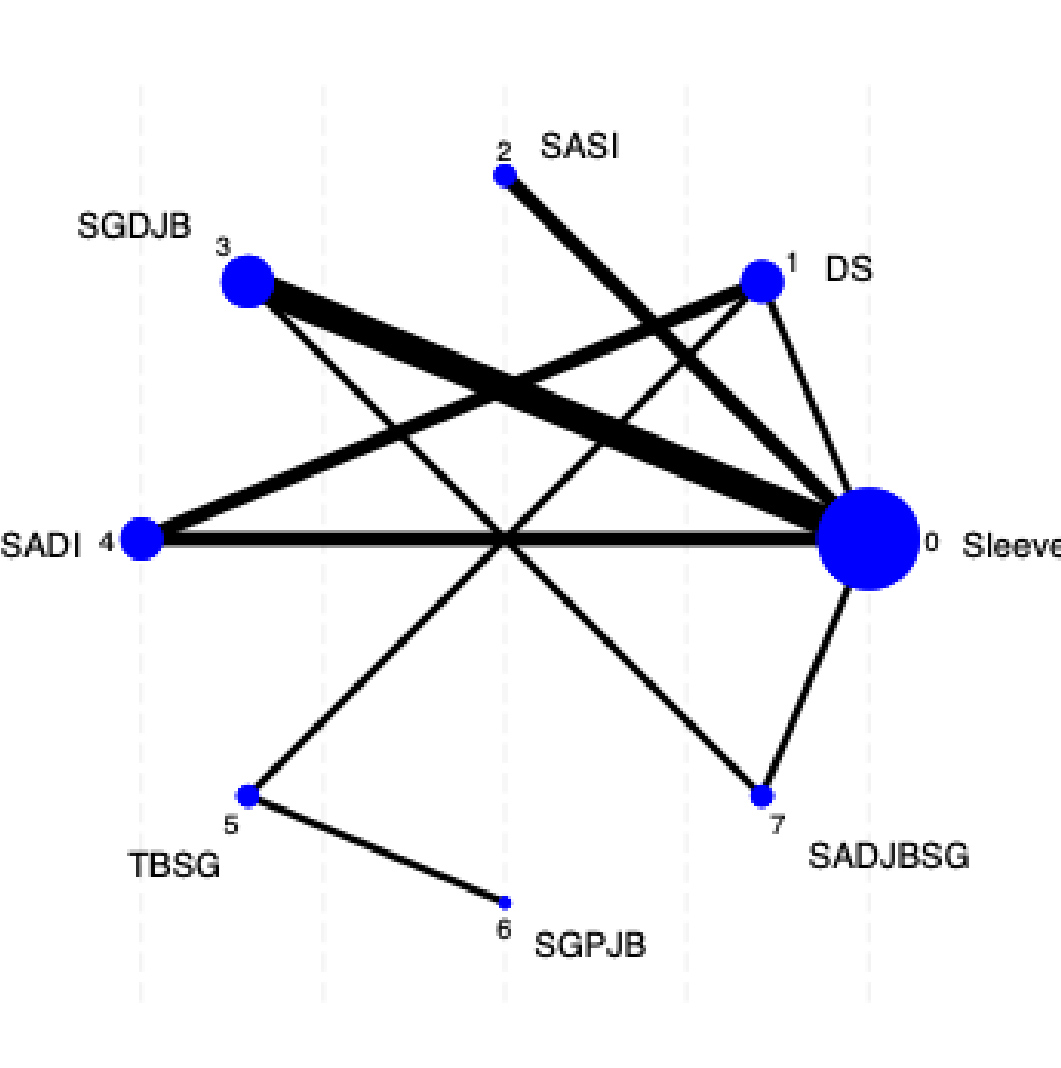
EWL network



TBWL network



DM network



Results

Thirty cohort studies were included, covering nine procedures: SG, duodenal switch (DS), single anastomosis sleeve ileal bypass (SASI), SG with duodenojejunal bypass (SGDJB), single anastomosis duodenoileal bypass (SADI), transit bipartition SG (TBSG), SG with proximal jejunal bypass (SGPJB), single anastomosis duodenojejunal bypass with SG (SADJBSG), and single anastomosis sleeve jejunal bypass (SASJ). DS demonstrated significantly greater EWL compared with SG (MD 14.95%, 95% CI 2.64–27.26%), while no other procedures showed significant differences. DS ranked highest for weight loss, followed by SASI and SGDJB, with consistent findings in sensitivity analyses excluding super-obese patients. For TBWL, DS again outperformed SG (MD 6.89%, 95% CI 1.49–12.49%). In terms of diabetes improvement, SASI was superior to SGDJB, SADI, SADJBSG, SG, and DS, with RRs (95% CI) of 1.41 (1.15–1.72), 1.35 (1.08–1.69), 1.46 (1.18–1.81), 1.38 (1.13–1.67), and 1.31 (1.02–1.66), respectively.

EWL

SG	3.70 (-22.51,29.91)	9.05 (-6.86,24.96)	3.84 (-22.58,30.26)	9.80 (-5.43,25.02)	9.17 (-3.78,22.12)	14.95 (2.64,27.26)
-3.70 (-29.91,22.51)	SGPJB	5.35 (-25.31,36.01)	0.14 (-37.08,37.36)	6.10 (-24.21,36.41)	5.47 (-23.76,34.70)	11.25 (-17.71,40.21)
-9.05 (-24.96,6.86)	-5.35 (-36.01,25.31)	SGDJB	-5.21 (-36.05,25.63)	0.75 (-21.27,22.77)	0.12 (-20.40,20.64)	5.90 (-14.22,26.02)
-3.84 (-30.26,22.58)	-0.14 (-37.36,37.08)	5.21 (-25.63,36.05)	SASI	5.96 (-24.53,36.45)	5.33 (-24.09,34.75)	11.11 (-18.04,40.26)
-9.80 (-25.02,5.43)	-6.10 (-36.41,24.21)	-0.75 (-22.77,21.27)	-5.96 (-36.45,24.53)	SASI	-0.63 (-20.61,19.36)	5.15 (-14.43,24.73)
-9.17 (-22.12,3.78)	-5.47 (-34.70,23.76)	-0.12 (-20.64,20.40)	-5.33 (-34.75,24.09)	0.63 (-19.36,20.61)	SADI	5.78 (-3.64,15.21)
-14.95 (-27.26,-2.64)	-11.25 (-40.21,17.71)	-5.90 (-26.02,14.22)	-11.11 (-40.26,18.04)	-5.15 (-24.73,14.43)	-5.78 (-15.21,3.64)	DS

TBWL

SG	3.19 (-8.79,15.17)	0.70 (-9.88,11.28)	1.36 (-4.31,7.02)	0.10 (-10.48,10.68)	1.02 (-5.11,7.15)	6.89 (1.49,12.29)
-3.19 (-15.17,8.79)	TBSG	-2.49 (-18.47,13.49)	-1.83 (-15.09,11.42)	-3.09 (-19.08,12.89)	-2.17 (-13.59,9.25)	3.70 (-6.99,14.39)
-0.70 (-11.28,9.88)	2.49 (-13.49,18.47)	SGDJB	0.66 (-11.34,12.66)	-0.60 (-11.28,10.08)	0.32 (-11.90,12.55)	6.19 (-5.68,18.07)
-1.36 (-7.02,4.31)	1.83 (-11.42,15.09)	-0.66 (-12.66,11.34)	SASI	-1.26 (-13.26,10.75)	-0.33 (-8.70,8.04)	5.53 (-2.30,13.37)
-0.10 (-10.68,10.48)	3.09 (-12.89,19.08)	0.60 (-10.08,11.28)	1.26 (-10.75,13.26)	SADJBSG	0.92 (-11.31,13.15)	6.79 (-5.09,18.67)
-1.02 (-7.15,5.11)	2.17 (-9.25,13.59)	-0.32 (-12.55,11.90)	0.33 (-8.04,8.70)	-0.92 (-13.15,11.31)	SADI	5.87 (1.85,9.89)
-6.89 (-12.29,-1.49)	-3.70 (-14.39,6.99)	-6.19 (-18.07,5.68)	-5.53 (-13.37,2.30)	-6.79 (-18.67,5.09)	-5.87 (-9.89,-1.85)	DS

DM improvement

SG	0.94 (0.86,1.03)	1.10 (0.76,1.60)	1.08 (0.79,1.46)	1.02 (0.92,1.13)	0.98 (0.94,1.02)	1.38 (1.13,1.67)	1.05 (0.91,1.22)
1.06 (0.97,1.16)	SADJBSG	1.17 (0.80,1.71)	1.14 (0.83,1.57)	1.08 (0.94,1.24)	1.04 (0.94,1.14)	1.46 (1.18,1.81)	1.12 (0.94,1.32)
0.91 (0.63,1.31)	0.86 (0.58,1.25)	SGPJB	0.98 (0.79,1.20)	0.92 (0.64,1.32)	0.89 (0.61,1.29)	1.25 (0.82,1.90)	0.96 (0.68,1.35)
0.93 (0.68,1.26)	0.88 (0.64,1.21)	1.03 (0.83,1.26)	TBSG	0.95 (0.71,1.27)	0.91 (0.67,1.24)	1.28 (0.89,1.84)	0.98 (0.75,1.28)
0.98 (0.88,1.09)	0.93 (0.81,1.07)	1.08 (0.76,1.55)	1.06 (0.79,1.41)	SADI	0.96 (0.86,1.08)	1.35 (1.08,1.69)	1.03 (0.92,1.16)
1.02 (0.98,1.07)	0.96 (0.87,1.06)	1.13 (0.78,1.64)	1.10 (0.81,1.50)	1.04 (0.93,1.17)	SGDJB	1.41 (1.15,1.72)	1.08 (0.93,1.25)
0.73 (0.60,0.88)	0.69 (0.55,0.85)	0.80 (0.53,1.22)	0.78 (0.54,1.12)	0.74 (0.59,0.92)	0.71 (0.58,0.87)	SASI	0.77 (0.60,0.98)
0.95 (0.82,1.10)	0.90 (0.76,1.06)	1.05 (0.74,1.47)	1.02 (0.78,1.34)	0.97 (0.86,1.08)	0.93 (0.80,1.08)	1.31 (1.02,1.66)	DS

Conclusion

Evidence from cohort studies suggests that DS may provide the greatest weight loss, while SASI appears most effective for diabetes control. Overall, SG and sleeve-plus procedures demonstrated comparable benefits, highlighting the need for further high-quality randomized trials.