Supplementary method

Statistical analysis for interobserver reproducibility

To assess interobserver reproducibility in the histopathological evaluation, all fragments were independently reviewed by two pathologists using identical pre-defined criteria for glandular tissue identification. Agreement between observers was analysed at three hierarchical levels:

1. Fragment level – the presence of glandular tissue (yes/no) for each fragment was compared between raters, and interobserver agreement was quantified using Cohen's κ (unweighted).

2. Case level – adequacy classification – for each biopsy, the glandular surface area attributed to glandular fragments by each pathologist was summed to determine whether the total glandular area met the predefined adequacy thresholds (≥ 4 mm^2 and ≥ 8 mm^2). Agreement for these binary adequacy outcomes was assessed using Cohen's κ.

3. Case level – glandular ratio – for each case, the glandular-to-total surface ratio was calculated for both raters. Agreement for this continuous variable was assessed using the intraclass correlation coefficient (ICC) under a two-way random-effects model for absolute agreement, single measures [ICC(2,1)].

All κ and ICC values were reported with corresponding 95% confidence intervals. Interpretation followed conventional thresholds: κ or ICC ≥ 0.75 indicated excellent agreement, 0.60–0.74 good agreement, and 0.40–0.59 moderate agreement. Statistical analyses were performed using R software (v. 4.4.1; R Foundation for Statistical Computing, Vienna, Austria) with the irr package.

Supplementary Table S1. Basic characteristics of enrolled biopsy specimens grouped by different diseases.

Characteristic	Sjögren's disease (n=56)	IgG4RD (n=29)	Chronic sialadenitis (n=34)	*p*-value
Male, n (%)	4 (7.1)	23 (79)	15 (44)	<0.001*
Age, year, median (IQR)	56.0 (18.5)	64.0 (12.0)	58.0 (23.3)	0.015*
Length of SMG gland, mm, median (IQR)	29.4 (6.5)[a]	33.8 (6.4)	29.9 (7.7)	0.069
Pass of CNB sampling, median (IQR)	1 (1)	1 (1)	1 (1)	0.749
Specimen length, mm, median (IQR)	9.3 (4.8)	10.3 (3.7)	9.9 (4.8)	0.295
Total surface area, mm^2, median (IQR)	6.9 (5.3)	7.3 (2.5)	5.5 (5.9)	0.062
Glandular surface area, mm^2, median (IQR)	6.4 (5.6)	6.4 (3.8)	4.1 (6.5)	0.212
Fatty infiltration, %, median (IQR)	7.8 (11.5)	0.6 (2.4)	1.0 (3.7)	<0.001*
Clinically significant haematoma, n (%)	1 (1.8)	0 (0)	1 (2.9)	>0.999

[a] Missing data in one of the patients
*p<0.05

CNB: core needle biopsy; IgG4RD: IgG4 related disease; IQR: interquartile range; SMG: submandibular gland.

Supplementary Table S2. Sensitivity analysis by excluding specimens with different lipid ratio for optimal specimen length in predicting glandular surface area ≥ 4 mm^2.

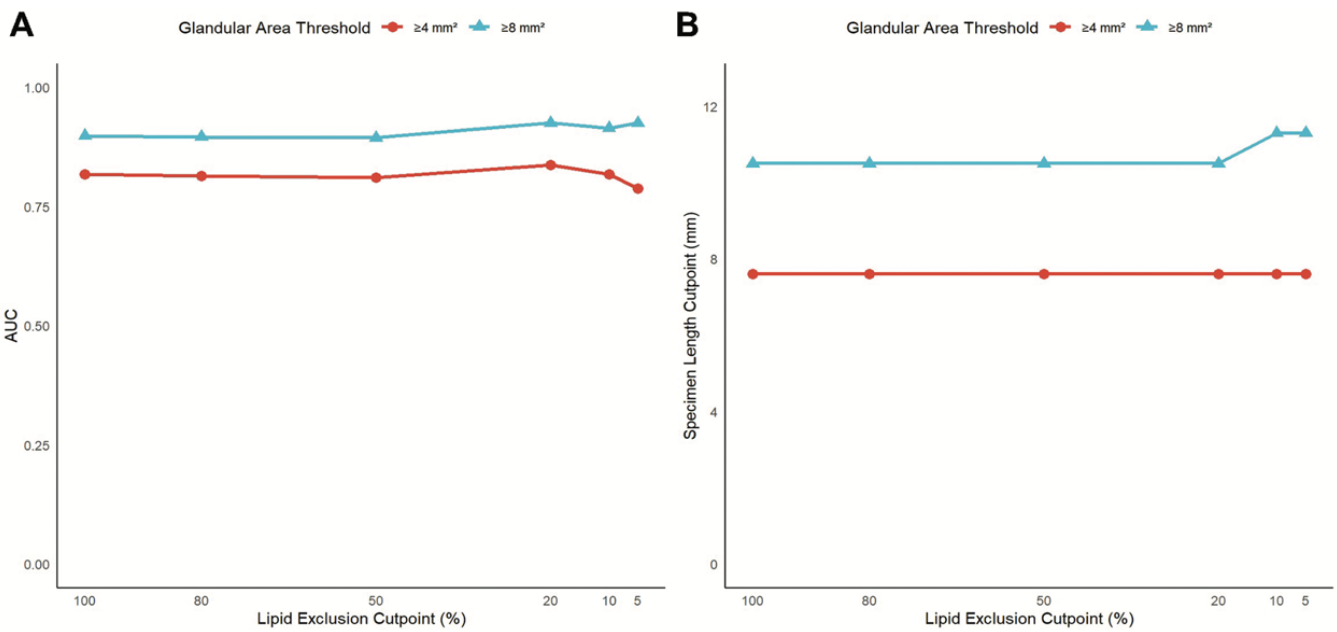| Threshold of excluding lipid ratio	n (percent excluded)	AUC	Optimal specimen length	Sensitivity	Specificity
Original analysis	0 (0)	0.817	7.6	0.924	0.600
>80%	1 (0.8)	0.814	7.6	0.924	0.590
>50%	3 (2.5)	0.811	7.6	0.924	0.595
>20%	13 (10.9)	0.837	7.6	0.919	0.625
>10%	28 (23.5)	0.817	7.6	0.905	0.607
>5%	46 (38.7)	0.787	7.6	0.920	0.522

AUC: area under curve.

Supplementary Table S3. Sensitivity analysis by excluding specimens with different lipid ratio for optimal specimen length in predicting glandular surface area ≥ 8 mm^2.

Threshold of excluding lipid ratio	n (percent excluded)	AUC	Optimal specimen length	Sensitivity	Specificity
Original analysis	0 (0)	0.898	10.5	0.892	0.805
>80%	1 (0.8)	0.896	10.5	0.892	0.802
>50%	3 (2.5)	0.894	10.5	0.892	0.797
>20%	13 (10.9)	0.925	10.5	0.912	0.833
>10%	28 (23.5)	0.914	11.3	0.821	0.905
>5%	46 (38.7)	0.925	11.3	0.833	0.939

AUC: area under curve.

A

B

Supplementary Fig. S1. Selected results of sensitivity analysis after excluding specimens with different lipid ratios.
A: AUCs for using specimen length to predict glandular surface area (≥4 and ≥8 mm^2, respectively);
B: Optimal specimen length cut-point for ROC curve for predicting glandular surface area (≥4 and ≥8 mm^2, respectively).

Supplementary Table S4. Histological features of submandibular gland core needle biopsy specimens from patients with Sjögren's disease.

Features	
Glandular surface area ≥4 mm^2, n (%)	38 / 56 (68)
Focus score ≥1, n (%)	15 / 38 (39.5)[a]
Focus score ≥1 or small lymphocytic infiltrates with lymphoepithelial lesions, n (%)	18 / 38 (47.4)[a]
Lymphoepithelial lesion, n (%)	10 / 56 (18)
Germinal centre, n (%)	4 / 56 (7.1)

[a]Focus score was not assessed in specimens with <4 mm^2 glandular tissue.