Table 1. Study characteristics of the articles included in the systematic review.

Author (Year)	Study Design	Participants/ patients	Baseline Characteristics (Median/mean age, gender)	Intervention	Comparator	Outcome
Chen et al. (2022) [10]	RCT	235	Age = 69.7+/-11.8 Female =112 (47.7%) Male = 123 (52.3%)	EUS-FNB	EUS-FNA + ROSE	**EUS-FNB**: accuracy =92.2%; specificity = 100%; sensitivity = 92.5%; procedure time= 19.3(8.0); Mean number of needle passes = 2.3(0.6); Cost-minimization = +$45 more in USA and +$102 more in Canada **EUS-FNA + ROSE**: accuracy = 93.3%; sensitivity = 96.5%; specificity 100%; mean procedure time = 22.7(10.8); Mean number of needle passes = 3.0(1.1); Cost-minimization = $719 in USA and $540 in Canada

Sbeit and Khoury (2021) [19]	Retrospective	74	Age = EUS-FNB: 66.7±11.4. EUS-FNA + ROSE = 72.2±14.5 Gender: EUS-FNB = Male 11 (52.4%). EUS-FNA + ROSE = Male 37 (69.8%) and female 16 (30.2%).	EUS-FNB	EUS-FNA + ROSE	Cost-analysis: EUS-FNB = $1226 ± 369.EUS-FNA +ROSE = $1158 ± 309.6
Chong et al. (2020) [14]	RCT	244	Age = 60.2(15.0) Male n=137 (56.1%) Female n= 107 (43.9%)	MOSE	EUS-FNTA	**MOSE**: yield = 92.6%; accuracy = 95.1%; sensitivity = 98.9%; specificity = 83.9%; number of passes = 2(1-3); procedure time n=22.2(10.7) **Conventional EUS-FNTA**: yield n= 89.3%; accuracy = 91.0%; sensitivity= 98.9%;

						specificity=68.8%; number of passes = 3
Leung Ki et al. (2019) [20]	Retrospective	46	Age = 70 Male =34 (74%) Female= 12(26%)	MOSE	n/a	**MOSE**: accuracy= 94%; sensitivity=92%; specificity= 100%; Number of passes = 1(1-2)
Mangiavillano et al. (2021) [21]	Retrospective	387	Age = 67+12 Male=233 (62%) Female = 145 (n=38%)	MOSE	n/a	**MOSE**: accuracy = 87.3%; sensitivity = 85.2%; specificity=100%
Nebel et al. (2021) [15]	RCT	65	Age: 59 (19-82); Gender: Female = 37, Male = 28	EUS-FNA + ROSE	EUS-FNA	**EUS-FNA + ROSE:** accuracy = 93%; procedure duration = 30±11.3; needle passes = 2.6±0.8; yield 81.8% **EUS-FNA:** accuracy = 88%; procedure duration = 37±7.2; needle passes = 3.5±0.8; yield = 84.3% Diagnostic yield was similar (non-significant) for

						ROSE and non-ROSE groups, considering overall patients and enrollment.
Milluzzo et al. (2023) [22]	Retrospective	91	n/a	EUS-FNA + ROSE	EUS-FNA	**EUS-FNA**: adequacy= 96.2%; yield = 76.9%; accuracy = 69.2%; sensitivity = 63.7%; specificity = 100% **EUS-FNA+ ROSE (first year)**: adequacy = 96.6%; yield = 89.7%; accuracy = 86.2%; sensitivity = 91.7%; specificity = 100%; **EUS-FNA+ ROSE (second year)**: adequacy = 100%; yield = 92.1%; accuracy = 89.5%; sensitivity = 91.2%; specificity=100%
So et al. (2021) [6]	Retrospective	75	Age = 62 Male= 39 (52%) Female= 36 (48%)	MOSE	n/a	MOSE: accuracy= 97.3%, sensitivity=96.7% specificity=97.8%Number of passes = 2 (2-5)
Sundaram et al. (2023) [23]	Retrospective	155	Age= 55.1 +12.9 Male = 93 (60%)	MOSE	ROSE	**ROSE**: sensitivity = 96.9%; specificity = 100% **MOSE**: sensitivity = 96.1 %; specificity = 100%

			Female = 62 (40%)			
Iwashita et al. (2015) [9]	Prospective	100	Age=69 Male = 59 (59%) Female = 41 (41%)	MOSE	n/a	MOSE: sensitivity= 94.1%; specificity = 100%; accuracy = 95.5%; Number of passes= 2
Eloubeidi et al. (2006) [25]	Prospective	540	Age = 63.0 Male = 412 (62.8%) Female = 244 (37.2%)	ROSE of EUS-FNA	n/a	ROSE: accuracy = 93.9%; sensitivity = 92.8%; specificity = 95.8%
Zhang et al. (2022) [16]	RCT	194	Age: 62.19±11.47 Male = 119 (61.3%)	EUS-FNA + ROSE	EUS-FNA	EUS-FNA + ROSE: Accuracy = 94.8%; sensitivity = 94.4%; specificity = 100%; adequacy = 100%; needle passes = 3.38 ± 1.00 EUS-FNA alone: accuracy = 70.1%; sensitivity = 65.1%; specificity = 100%; adequacy = 80.4%; needle passes = 3.22 ± 0.89

Crinò et al. (2021) [17]	RCT	771	Men = 56.4%; Women = 43.6% Age: 67.5±11.5	EUS-FNB + ROSE	EUS-FNB alone	EUS-FNB + ROSE: accuracy = 96.4%; specificity = 100%; sensitivity = 96% EUS-FNB alone: accuracy = 97.4%; specificity = 100%; sensitivity = 97.3%
Sonthalia et al. (2024) [18]	RCT	96	n/a	EUS-FNB + MOSE	EUS-FNA alone	EUS-FNB + MOSE: accuracy = 95.8%; yield = 97.9%; needle passes = 2 EUS-FNA alone: accuracy = 91.6%; yield = 95.8%; needle passes = 3 Procedure duration was similar for the two mechanisms.
Wong et al. (2024) [26]	Prospective	65	Age: 66 Gender: Women = 32 (48.5%); Men = 33 (51.5%)	MOSE	Cytologist interpretation & IRCETE	MOSE: accuracy = 57%; needle passes = 1; procedure time = 4.0±1.7 IRCETE: accuracy = 59%; needle passes = 1; procedure time = 14.3±4.7 Cytologist: accuracy = 64%; needle passes = 1
Guan et al.	Retrospective	141	Age: EUS-FNA =	EUS-FNA +	EUS-FNA alone	EUS-FNA + MOSE: sensitivity = 89.8%;

(2024) [24]			65 (60-72); EUS-FNA + MOSE = 66 (58-71) Gender: EUS-FNA: Male = 34, Female = 2; EUS-FNA + MOSE: Male = 41, Female = 23	MOSE		specificity = 100%; accuracy = 90.6% EUS-FNA alone: sensitivity = 75%; specificity = 66.7%; accuracy = 75%

Note: RCT – randomized controlled trial; EUS-FNB - Endoscopic ultrasound-guided fine needle biopsy; EUS-FNA – Endoscopic ultrasound-guided fine-needle aspiration; ROSE – Rapid on-site evaluation; MOSE - Macroscopic on-site evaluation; EUS-FNTA – Endoscopic ultrasound-guided fine-needle tissue acquisition; IRCETE – in-room cytologic evaluation by trained endo sonographer

Table 2. Quality assessment via NOS scale

Study ID	Exposed cohort representativeness	Non-exposed cohort selection	Exposure verification	Initial outcome absence	Cohort comparability (Design/Analysis adjusted for confounders)	Outcome evaluation	Sufficient follow-up	Cohort follow-up	Total score	Overall quality
Sbeit and Khoury (2021)	1	0	1	1	0	1	1	1	6	Fair
Leung Ki et al. (2019)	1	0	1	1	0	1	1	1	5	Fair
Mangiavillano et al. (2021)	1	0	1	1	0	1	1	1	5	Fair
Milluzzo et al. (2023)	1	0	1	1	0	1	0	1	4	Fair
So et al. (2021)	1	0	1	1	0	1	1	1	5	Fair
Sundaram et al. (2023)	1	0	1	1	0	1	0	1	5	fair
Iwashita et al. (2015)	1	0	1	1	0	1	0	1	5	Fair
Eloubeidi et al. (2006)	1	0	1	1	0	1	1	1	5	Fair
Wong et al. (2024)	1	0	1	1	0	1	1	1	6	Fair
Guan et al. (2024)	1	0	1	1	0	1	0	1	4	Fair