

# Ambiguous diagnoses of borderline ovarian tumors at frozen section with a definite diagnosis of invasive carcinoma: consequences for counseling and perioperative treatment.

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## Introduction

Borderline ovarian tumors (BOTs) and invasive epithelial ovarian cancers (OCs) are tumors with differences regarding their clinical behavior, prognosis and treatment, which highlights the importance of making a proper perioperative frozen section diagnoses (FSD). However, FSDs of borderline ovarian tumors (BOTs) are not always straightforward (ambiguous), and sometimes the pathologist may tend towards a diagnosis of invasive carcinoma. It must be decided whether or not full ovarian cancer (OC) staging should be performed to prevent a second procedure in the event of OC as a definite postoperative diagnosis. The aims of the present study were (i) to compare (un)ambiguous BOT frozen section diagnoses (FSDs) and their definite diagnoses, (ii) to evaluate how often full OC staging was performed in these cases and (iii) to discuss managerial implications.

## Methodology

All patients who underwent ovarian surgery with perioperative frozen section analysis in the participating hospitals between January 2007 and July 2018 were identified and included in case of a BOT FSD (whether or not tending towards invasive carcinoma) and a definite diagnosis of a BOT or carcinoma. FSDs were considered ambiguous when tending towards OC (e.g. "at least BOT"). Staging procedures with at least a lymph node sampling (LNS) were considered as staging procedures as recommended for OC and patients in whom no lymph node sampling has been performed were considered to be staged according to the BOT guideline

	Serous tumour (n=106)		Mucinous tumour (n=88)	
	Unambiguous BOT FSD (n=92)	Ambiguous BOT FSD towards carcinoma (n=14)	Unambiguous BOT FSD (n=64)	Ambiguous BOT FSD towards carcinoma (n=24)
Full OC staging (LNS)	5 (5.4%)	2 (14.3%)	2 (3.1%)	10 (41.7%)

## Results:

Fourteen of 106 patients (13,2%) with a serous tumor had an ambiguous FSD. Two of them (14.3%) underwent a full OC staging procedure, who were both diagnosed with OC as a definite diagnosis (table 1). Of the remaining 92 patients (86,8%), 5 (5.4%) underwent a full staging procedure, of which one was diagnosed with OC. With respect to mucinous BOT FSDs, 24 of 88 (27,3%) were ambiguous. Ten of these 24 patients underwent full OC staging, of which two were diagnosed with OC. Of the remaining 64 patients with an unambiguous mucinous BOT FSD, 2 (3.1%) underwent full OC staging, of which one was diagnosed with OC.

Table 2. Numbers of patients with a serous BOT or carcinoma as a permanent histopathological diagnosis in relation to the applied protocol (BOT or OC).

	Serous tumour (n=106)			
	Unambiguous FSD (n=92)		Ambiguous BOT FSD (n=14)	
	BOT (n=90)	Carcinoma (n=2)	BOT (n=9)	Carcinoma (n=5)
Staging conform BOT protocol	86 (95.6%)	1 (50.0%)	9 (100.0%)	3 (60.0%)
Staging conform OC protocol	4 (4.4%)	1 (50.0%)	0 (0.0%)	2 (40.0%)

The numbers and percentages written in italics were treated according to the appropriate protocol.

Five of 14 patients (35.7%) with an ambiguous serous BOT FSD and 6 of 24 patients (25.0%) with an ambiguous mucinous BOT FSD were diagnosed with OC, which were both higher percentages than in case of patients with an unambiguous FSD.

Treatment of BOTs according to the OC protocol (overtreatment) was observed most often in the ambiguous mucinous BOT FSD group (8 of 18 patients (44.4%), table 3). In each group at least half of the patients with OC as a permanent histopathological diagnosis was treated according to the BOT protocol, with a maximum of 87.5% of patients in the unambiguous mucinous BOT FSD group (table 2 and 3).

Table 3. Numbers of patients with a mucinous BOT or carcinoma as a permanent histopathological diagnosis in relation to the applied protocol (BOT or OC).

	Mucinous tumour (n=88)			
	Unambiguous BOT FSD (n=64)		Ambiguous BOT FSD (n=24)	
	BOT (n=56)	Carcinoma (n=8)	BOT (n=18)	Carcinoma (n=6)
Staging conform BOT protocol	55 (98.2%)	7 (87.5%)	10 (55.6%)	4 (66.7%)
Staging conform OC protocol	1 (1.8%)	1 (12.5%)	8 (44.4%)	2 (33.3%)

The numbers and percentages written in italics were treated according to the appropriate protocol.

## Conclusion:

Ambiguous FSDs tending towards the diagnosis of invasive carcinoma are not uncommon and influence perioperative management. In case of an ambiguous sBOT FSD there is a considerable chance of OC as a permanent diagnosis and treatment according to the OC protocol should be considered and patients should be counseled about the potential risks and benefits. With respect to ambiguous mucinous BOT FSDs treatment according to the OC protocol is not advocated because the chance of an invasive carcinoma as a permanent diagnosis is lower and the beneficial effect of a lymph node sampling in case of FIGO stage I mucinous carcinomas (expansile growth pattern) seems limited.