Review of screening mammograms from interval cancers - First results of the pilot study of mammography screening in Lower Saxony

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Objectives

Interval cancers (IVCa) are breast cancers (ICD-10 C50 + D05) which appear in women between two regular mammography screening examinations, that is within 24 month after a negative screening **(see figure 1)**.

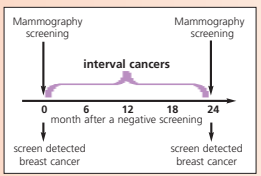

Figure 1: Window for interval cancers

The determination of IVCa is an important quality parameter for optimizing the mammography screening program and for early forecasts regarding a mortality-reducing screening effect. IVCa are a heterogenic group of tumours **(see table 1)**. They are inevitable in a screening programme but their number should be kept as low as possible, particularly the number of false negative cases.

The review process and the level of acceptable IVCa-rates are defined in the European guidelines for quality assurance in breast cancer screening [1] and in § 23 Abs. 10 of the Krebsfrüherkennungs-Richtlinie from 15.10.09. The pilot study in Lower Saxony, being the first in Germany, is aimed to gain experiences with the different review processes of IVCa.

Methods

In June 2010, 65 IVCa were identified by record linkage of data from the population-based epidemiological cancer registry in Lower Saxony (EKN [2]) with the data of 25.000 women aged 50 to 69 years, who attended the 2006 mammography screening in one of eight screening units of Lower Saxony. Three independent review processes were undertaken by radiologists working with the mammography reference center (Referenzzentrum Mammographie Nord):

'provisional classification 1'
According to the European guidelines the screening mammograms should first be reviewed without seeing the mammograms taken at the time of diagnosis (blind review).

'provisional classification 2'
Afterwards, the review is repeated with medical tumour data from the cancer registry (diagnosis, side, localisation, histology, tumour stage, grading).

'definitive classification 3' (gold standard)
Lastly radiologists compare the screening mammograms with diagnostic mammograms and additional diagnostic documents to classify the IVCa into five categories (*true interval, minimal signs, false negative, radiologically occult, unclassifiable*, **see table 1**). If the diagnostic mammograms or other diagnostic information are not available, it is not possible to make a definitive classification for the IVCa. According to the European guidelines these cases are categorised as 'unclassifiable'.

The proportion of IVCa in the five categories will be shown. Then the results of the three review processes will be compared.

Interval cancer categories	Review of screening mammo-	Diagnostic mammo-grams	Definitive classification 3 (65 interval cancers)	
			n	%
true interval	negative	positive	37	57%
minimal signs	minimal signs	minimal signs or positive	6	9%
false negative	positive	positive	9	14%
radiologically occult	negative	negative	0	0%
unclassifiable	any	not available	13	20%

Table 1: 'Definitive classification' of all 65 interval cancers based on the European Guidelines [1]

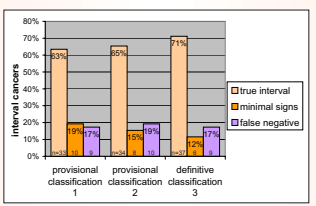

Figure 2: Three review processes of 52 completely documented IVCa: 1) only screening mammograms; 2) screening mammograms + EKN-Data; 3) screening + diagnostic mammograms

provisional classification 1	definitive classification 3 'gold standard'		
	true interval	minimal signs	false negative
true interval	31	2	0
minimal signs	6	3	1
false negative	0	1	8
total (52 IVCa)	37	6	9

Table 2: Divergence between provisional classification 1 and definitive classification 3 (52 completely documented IVCa)

Results

From 65 IVCa 22 were diagnosed in the first year after screening, 43 in the second year.

In the 'definitive classification 3' of all 65 IVCa 37 cases (57%) were classified as 'true interval' cancers. The screening mammograms showed 'minimal signs' for 6 cases (9%); 9 cases (14%) were 'false negative' diagnoses. Diagnostic mammograms or other diagnostic information were not available for 13 cases (20%). According to the European guidelines these 13 IVCa are categorized as 'unclassifiable'.

52 completely documented IVCa were compared in the mentioned three review processes. The 13 IVCa with missing diagnostic mammograms were excluded. The results are shown in **figure 2**. The proportion of true IVCa increased from 63% ('provisional classification 1') to 71% ('definitive classification'). The specific information from the diagnostic mammograms offered a more valide classification of IVCa with 'minimal signs'; the proportion declined from 19% to 12%. There were only small differences between the 'provisional classification 1 + 2', but the proportion of 'false negative' cases was a little bit higher in the second classification (17% vs. 19%).

In **table 2** is shown the divergence between the 'definitive classification 3' and the 'provisional classification 1'. When the classification took place only with screening mammograms, particularly, in the category 'minimal signs' only 3 from 6 cases showed the correct classification. In the category 'false negative' 1 case was erroneously classified as 'minimal signs'.

Discussion

The results of this pilot study illustrate the importance of diagnostic mammograms for the review process. Actually, it is not possible to make a 'definitive classification' of all IVCa because diagnostic mammograms are not available for all cases (in this study 20% were missing). Additionally the record linkage in the cancer registry can not be varified for incorrect matching for these cases.

In the 'provisional classification 1' the number of cases with minimal signs is overrated. A review process only with screening mammograms could lead to an increasing recall rate for healthy women.

Without 'definitive classification' there won't be any comparable results of IVCa-rates and frequencies of false negative diagnoses. In contrast to the Scandinavian and some other European countries, the diagnostic records and mammograms in Germany can only be accessed with the consent of the patient; this will be difficult for the screening program. Alternatively, the government can enact laws to facilitate the transfer of the diagnostic mammograms to the review centers.

Literature:
[1] European guidelines for quality assurance in breast cancer screening and diagnoses, Fourth edition

[2] Urbschat I., Kieschke J., Schlahnstedt-Jahn U., von Gehlen S., Thiel A., Jensch P. (2005): Beiträge bevölkerungsbezogener Krebsregister zur Evaluation des bundesweiten Mammographie-Screenings. Gesundheitswesen, 67: 448-454

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