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Opportunistic breast cancer early detection in Tyrol, Austria 1996–2004 Is a mammography-screening program necessary?

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Abstract

Purpose: Evaluate the need for a mammography-screening program for Tyrol, as recently proposed in an ÖBIG feasibility study commissioned by the Austrian Ministry for Health and Women, in view of the already existing organized opportunistic screening.
Materials and methods: This author has examined the state of breast cancer early detection and diagnosis in Tyrol. A comprehensive review of all available data and results based on 3340 primary biopsy recommendations between 1996 and 2004 at our breast centre was performed.
Results: Early detection has been improved by organizing the existing opportunistic screening through a true team approach, incorporating not only the clinic's specialties, but also the private radiologists and referring physicians. In 2004, our centre made the definitive diagnosis in 230 (67.6%) of the about 340 primary breast cancer cases occurring yearly in Tyrol with 62.2% being discovered by routine examination and 74.3% stemming from second opinion examinations. About 92.4% of our primary biopsies are performed minimally invasive with an overall 42.9% (1375 of 3205 cases) malignancy rate. Pathological TNM-staging was obtained in over 95% of women under 70 years of age. On average 55.3% (62.0% in 2004) of all discovered cancers were TNM-stage 1 or better lesions (76.2% in our routine patients). With an overall participation of about 75% of our target group (women over 34 years), it is women under the age of 50 years, who most consistently follow our recommendations, resulting in an above average rate of 58.5% TNM-stage 1 and better lesions for all discovered breast cancers (routine and symptomatic) in this group.
Conclusions: Opportunistic screening with a true team approach, combined with minimally invasive diagnosis and a strive for excellence have resulted in improved diagnosis, ever expanding patient and referring physician acceptance and an increase of positive prognostic factors, which eclipses the results of any published international mammography-screening program. A program as proposed by the ÖBIG would only represent one giant leap backwards for Tyrolean womankind!

Keywords: Breast cancer; Mammography; Opportunistic; Screening; Breast ultrasound; Tumor staging

1. Introduction

Breast cancer is the most prevalent malignancy in women, affecting about one in ten in Tyrol, Austria. In the USA where the number now stands at one in eight women, breast cancer has become the leading single cause of death in women between 40 and 55 years of age. A feasibility study [1] for a mammography-screening program for Austria according to European Union guidelines commissioned by the Austrian Ministry for Health and Women was recently published by the ÖBIG (Österreiches Bundesinstitut für Gesundheit). The three major goals for the program are cited as: increasing early detection of breast cancer, i.e. TNM-stage 1 or better disease; lowering the mortality by 30–35% and improving quality of life though more efficient methods. This is to be achieved by screening only women between the ages of 50 and 69 years once every 2 years.

Especially statements made about the poor status of breast cancer detection in Austria, led this author, as chairman of the "Workgroup for Early Breast Cancer Detection for Tyrol" [2], radiological head of the BrustGesundheitZentrumTirol® and Tyrolean delegate to this "Mammographie-Screening

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feasibility" project, to examine the current state of opportunistic breast cancer early detection in Tyrol, Austria.

Tyrol's population, as that of the rest of Austria, has an excellent universal system of health and medical coverage. There is no organized mammography-screening program like Finland, Sweden or Canada, but improved patient and physician awareness and universal access have resulted in widespread so-called opportunistic screening (i.e. those women having the opportunity) similar to that which is most common in the United States. Official mammography-screening programs appear to have limited success in areas that offer alternate options. The Canadian screening programs have a patient compliance of only about 25% whereas, according to the 1998/1999 Canadian National Population Health Survey, 65% of women report having regular mammograms, indicating that over 60% of women having mammography prefer going to fee-for-service institutions [3].

A review and analysis of the current breast imaging practices in Tyrol is presented. Results from our breast centre based on 3440 biopsy recommendations and 1240 primary breast cancer cases between 1996 and 2004 are reviewed. The efficacy of our opportunistic breast cancer early detection concept is compared to international screening programs and our fulfillment of the stated ÖBIG goals is examined.

2. Materials and methods

All organized breast cancer detection programs definitely reduce breast cancer mortality [4]. In July 1998, the "Workgroup for Early Breast Cancer Detection for Tyrol" with representatives from the Tyrolean Health Ministry, the major Tyrolean Social Health Insurer (TGKK), the Tyrolean Medical Society (Tiroler Ärztekammer) and specialty representatives of gynecology, radiology and from the University of Innsbruck agreed upon breast cancer early detection recommendations. Tyrol has the entire necessary medical infrastructure in place, including adequate private radiologists, hospital departments, the university clinics and a patient and physician-accepted universal health care system. The goal was to have the maximum number of patients possible partake in regular breast cancer early detection within the bounds of this existing infrastructure. The recommendations included monthly breast self-examination, yearly examination by a physician and yearly mammography, if necessary with adjunctive breast ultrasound, beginning at age 35–40, every 2 years after 60 years of age. In addition ongoing patient information and enlightenment via the media and possibly direct mailings, official guidelines to the primary physicians for the recommended early detection of breast cancer and the development of a centralized database to monitor quality, compliance and results for all women. Due to the extremely restrictive Austria privacy laws, this last recommendation as well as direct mailings could not yet be implemented. Since most patients follow their physician's recommendations, a very high patient compliance could be achieved by having the primary physicians (general practitioners, gynecologists, internists) refer their patients to the private radiologists or clinics for yearly mammography and breast ultrasound as needed.

2.1. University-based referral centre

The diagnostic breast imaging service of the Radiology II Department of the University Hospital of Innsbruck was the seed that developed into Tyrol's major breast cancer referral centre. Through a true team approach [5] we quickly developed a close and successful relationship with the in-house breast service as well as the in-house gynecological pathology section, both divisions of the Department of Obstetrics and Gynecology. After many basic changes and staff training, we began performing large core needle biopsies with ultrasound guidance [6]. Concurrently we organized weekly interdisciplinary patient conferences, which now also include radiation therapy, oncology, plastic surgery, nuclear medicine and nursing. Through these we were soon able to overcome the typical turf conflicts and convince our colleagues of the many advantages of large core needle biopsy. In the year 1996, only 49 (29.2%) of the 168 performed initial biopsies were performed as minimally invasive biopsies. By the year 2004 minimally invasive biopsies made up 92.4% (533 of 577).

In March 2003 as a result of the strictly defined structures and quality control, the diagnostic breast imaging section of the Department of Radiology II of the University of Innsbruck could be certified according to the ISO Norm 9001:2000 (No. 3075/0) standards. In conjunction with the Department of Obstetrics and Gynecology and as the BrustGesundheitZentrumTirol® we were subsequently certified in November 2003 (recertified January 2005) as the first Austrian (11th in Europe) breast cancer referral centre to fulfill all European Union requirements according to the German Cancer Society, the German Society for Senology and the European Society of Mastology (EUSOMA) guidelines as well as all national requirements.

2.2. Incorporation of the extramural physicians

At the same time we built up interconnections with the surrounding private radiologists, outlying hospitals and referring physicians. This was initially accomplished by routinely sending copies of reports of the patients they had examined and we had consulted upon, including the results of the biopsies we performed, thus supplying the private radiologists immediate feedback on lesions they had discovered, something that had rarely been done until then. We also set up various mammography meetings and other continuing education programs for them as well as for other referring physicians. Since many private physicians have a certain, not unfounded fear, that their patients will be appropriated by the university hospital, they are sometimes hesitant to refer them there unless absolutely necessary. After consulting on a patient, we specifically recommend the patient return to her original

radiologist for routine follow-up. When questioned by the patient, if she should not better return to our department, we answer, "Who detected the questionable area in the first place?"

These postulated reasons for the absolute and relative increase of second-opinion breast cancer cases from 27 of 69 (39.1%) in 1996 to 171 of 230 (74.3%) cases in the year 2004, have been confirmed by the radiologists to be a result of our practices. Only about half (48.2%) of the second opinion cases are biopsied. The remaining cases are referred back to the radiologists for routine follow-up. Even these radiologists perform only so-called "complete mammography" irregardless of indication (i.e. routine examination or symptomatic patients). After taking a history and performing a physical breast examination, the four- or six-view mammograms are reviewed and if necessary additional projections performed. Additional breast ultrasound (68.3% of mammograms) is not only performed in cases of suspicious mammographic or physical findings, but also in patients with dense breast tissue, since in our experience most of the about 14% mammographically occult carcinomas can be detected with high resolution breast ultrasound [7]. The patient speaks with the radiologist and receives her films and a written report immediately. Patients with suspicious findings are usually referred to the BrustGesundheitZentrumTirol® for second opinion consultation and possible biopsy, often on the same day.

3. Results

In the year 2003, 5 years after the implementation of the breast cancer early detection recommendations, over 102,000 mammograms and about 70,000 breast ultrasound examinations were performed in all of Tyrol (see Table 1). About 78% of the mammograms and 71% of the breast ultrasound examinations were performed in private radiologists offices. The population of women 35 years and older (our target population) was about 189,000. Of the 27,047 mammograms performed at our site between January 1996 and May 2004, 12,228 were repeat patients with an average interval of 16 months between examinations. The assumption of a similar rate in all of Tyrol would imply that over 60% of women over 34 years would be having a mammogram every 16 months. Since the actual average interval is probably longer than at our institution, 75% of women every 18 months would be a reasonable estimate (more accurate numbers are not obtainable at this time).

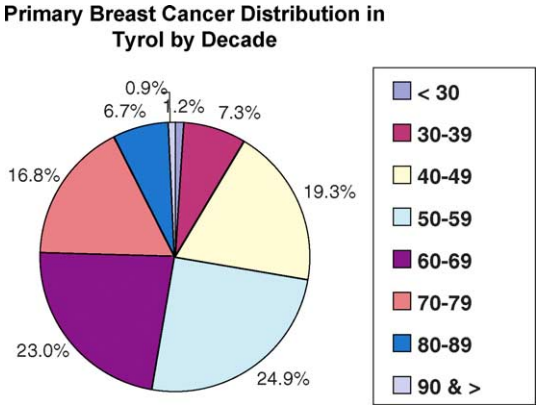

Plate 1. Age distribution of the 1240 primary breast cancers diagnosed at our centre between 1996 and 2004.

3.1. Age distribution

Graph 1 demonstrates the age distribution of the 1240 primary breast cancers diagnosed between 1996 and 2004 at our centre. Ninety-six percent (96%) of the primary breast cancer cases were in women over the age of 34 years. Twenty-eight percent (28%) occurred in women below the age of 50 years and 24% in women in the prime of life between 35 and 49 years of age.

We have compared our projected age incidences with those of the Tyrolean Tumor Registry for the 10 years period from 1988 to 1997. Our yearly averages and age incidences for the years 1996–2004 are very comparable but demonstrate a definite shift from the older toward the younger age groups. A comparison of our projected incidences with those published for all of Austria by Statistik Austria [8] for 1999, also confirm this difference (see Graph 2). Assuming no significant difference in the actual incidence of breast cancer between these time periods, our results would equate to about a 1–1.5 year earlier diagnosis in patients under 50 and about 2.5–5 years in those 50 years and older, when compared with the earlier Tumor Registry results. The time of earlier diagnosis was calculated by increasing the diagnosis age for each and every one of our patients by the appropriate values until the decade distributions matched the earlier Tumor Registry values.

Table 1
Number and distribution of breast imaging studies performed in Tyrol in the year 2003

Breast imaging in Tyrol 2003	Radiologists	Hospitals	Breastcentre	Total (average) for Tyrol
Mammograms	79211	18388	4487	102086
Ultrasound	49505	16093	4111	69709
Mammograms (%)	77.6	18.0	4.4	100.0
Ultrasounds (%)	71.0	23.1	5.9	100.0
US/mammograms (%)	62.5	87.5	91.6	68.3

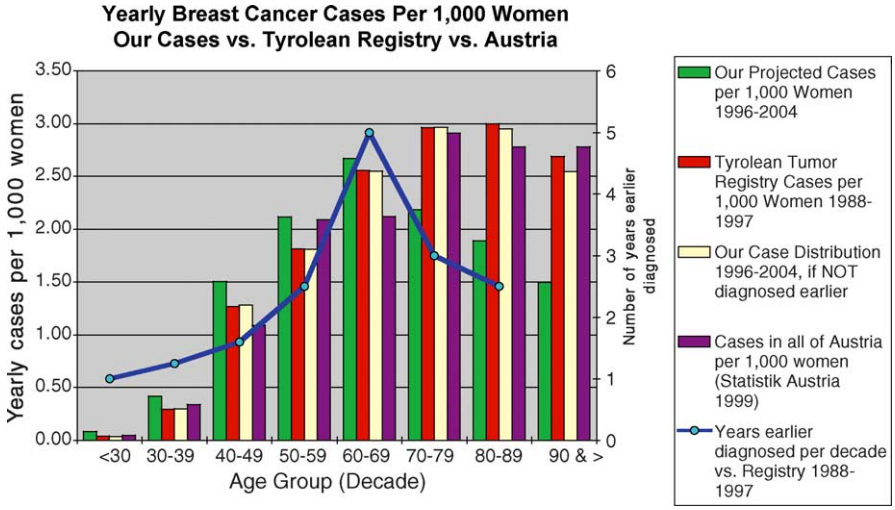

Plate 2. Comparison of projected yearly diagnosed primary breast cancer cases by age group based on our 1996–2004 results with those from the Tyrolean Tumor Registry for the period from 1988 to 1997 and for all of Austria based on the published results from Statistics Austria from 1999.

3.2. Biopsy results and malignancy rates

A total of 3250 (96.0%) of the 3340 suspicious lesions were pathologically proven, either though the 2937 definitive initial biopsies or at the time of the 268 performed repeat biopsies. These resulted in a total of 1240 (38.7%) primary cancers of the breast, 93 (2.9%) recurrences of known breast cancers, 42 (1.3%) metastatic lesions from other organs including secondary lymphoma and 1830 (57.1%) benign lesions (see Table 2). The combined malignancy rate of 42.9% is well above the approximately 20% malignancy rate in the USA [9].

3.3. Positive prognostic factors

The most important prognostic factors for breast cancer survival have always been axillary lymph node status and tumor size (classification) [10]. We employ a simplified classification for prognosis estimation and comparison. The "BEST" rating indicates a negative axillary lymph node status and a tumor size less than or equal to 2 cm as well as DCIS. This equates to TNM-stage 1 disease or better. The "POOR" rating is for cases with positive axillary lymph nodes and a tumor size greater than 2 cm. In between are "GOOD", negative axillary lymph nodes and tumor size greater than 2 cm and "FAIR", positive axillary lymph nodes and a tumor size less than or equal to 2 cm.

There has been a progressive improvement of positive prognostic factors from 41.9% TNM-stage 1 and better disease in1996 to 62.0% in 2004 (see Table 3). Both symptomatic and routine cases are included in these numbers.

It is generally stated that mammography is not as reliable in women under 50 years of age due to the higher rate of dense tissue. This is also one of the reasons given for NOT screening this population. Our recommendations however include routine yearly mammographic examinations beginning at age 35 with breast ultrasound if needed. In our experience breast cancers found in women between 40 and 49 years have

Table 2
Biopsy results for the 3205 pathologically proven cases by year (repeat biopsies included)

Final results including re-biopsies	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total	Percent
Definative initial biopsy	161	206	288	267	269	337	399	485	525	2937	
Percent definative initial biopsy	95.8	92.8	93.2	93.0	92.1	88.0	86.9	90.1	91.0	90.8	
Definative repeat biopsy	5	13	16	18	22	41	52	50	51	268	
Total primary breast cancer	69	77	89	96	124	158	171	226	230	1240	38.7
Total recurrent breast cancer	3	9	14	9	9	18	8	10	13	93	2.9
Total metastases including two lymphoma	5	8	8	4	5	2	4	2	4	42	1.3
Total benign biopsy results	89	125	193	176	153	200	268	297	329	1830	57.1
Total pathologically proven cases	166	219	304	285	291	378	451	535	576	3205	96.0
Total insisted on follow-up → benign	8	5	14	4	10	9	11	7	7	75	2.2
Total biopsy refused or not done	7	5	12	7	6	4	8	7	4	60	1.8
Total requested biopsies	181	229	330	296	307	391	470	549	587	3340	
Percent insisting on follow-up	4.4	2.2	4.2	1.4	3.3	2.3	2.3	1.3	1.2	2.2	Malignancy rate 42.9
Total percent non-compliant	8.3	4.4	7.9	3.7	5.2	3.3	4.0	2.6	1.9	4.0	

Table 3
Yearly prognosis improvement based on 1222 fully staged primary breast cancers including DCIS (1240 diagnosed)

Year vs. prognosis	Poor	Percent	Fair	Percent	Good	Percent	Best	Percent	Totals
1996	17	27.4	10	16.1	9	14.5	26	41.9	62
1997	20	27.8	6	8.3	10	13.9	36	50.0	72
1998	17	21.5	9	11.4	8	10.1	45	57.0	79
1999	19	23.5	11	13.6	6	7.4	45	55.6	81
2000	24	21.6	8	7.2	13	11.7	66	59.5	111
2001	29	19.7	20	13.6	16	10.9	82	55.8	147
2002	24	15.4	34	21.8	19	12.2	79	50.6	156
2003	45	21.0	31	14.5	20	9.3	118	55.1	214
2004	25	12.5	31	15.5	20	10.0	124	62.0	200
Totals/average	220	19.6	160	14.3	121	10.8	621	55.3	1122

an even higher rate of TNM-stage 1 or better disease (58.5%) when compared to the average of 55.3% for all patients (see Table 4).

Symptomatic patients, i.e. a palpable mass, have an only 28.5% chance of having discovered a breast cancer with a "BEST" prognosis. On the other hand, if the breast cancer was found during a routine examination the chance of an early lesion increases to 76.2%. Even patients between 35 and 49 years of age have a 73.6% chance of a "BEST" prognosis, if their cancer is found routinely. For those patients who have yearly examinations the chance is 80.6% and drops to 71.0% for those going only every 2 years (see Table 5).

We were able to obtain very accurate information over the numbers of mammograms and breast ultrasound examinations performed in Tyrol over this same time period. The extramural numbers came from the Tiroler Gebietskrankenkasse that insures 80% of the population. The hospital-based numbers were obtained from the radiology departments of all the hospitals in Tyrol. The graph (see Table 6 and Graph 3) shows the parallel increases of improved staging, routinely discovered cancers and numbers of mammograms and breast ultrasounds performed in Tyrol over the same time period. We are certain that the shift toward the younger age groups and the earlier cancer stages are at least in part a direct result of the increased imaging rate. This should consequently lead to improved survival and cure of the thus earlier detected breast cancer, which however can only be absolutely proven over time when morbidity and mortality rates become available. Initial results from the Tumor registry of Tyrol up to 1999 are however already suggesting this improvement.

Initially we were disturbed by the decrease in lymph node negative cases beginning in the year 2001 and this even though the tumor sizes were decreasing. The explanation is found in the dramatic increase in the percentage of performed sentinel node biopsies. This method, although much less invasive than the usual axillary dissection, yields a higher rate of positive results because of the different pathological examination of the specimens [11]. Data from 2003 and from the 200 staged cases in 2004 (69.5% negative, 7.0% only

Table 4
Age distribution of positive prognostic factors based on 1122 fully staged primary breast cancers including DCIS (1240 diagnosed)

Age vs. prognosis	poor	Percent	Fair	Percent	Good	Percent	Best	Percent	Totals
20–29 years	4	33.3	4	33.3	0	0.0	4	33.3	12
30–39 years	26	29.2	15	16.9	9	10.1	39	43.8	89
40–49 years	43	18.2	38	16.1	17	7.2	138	58.5	236
50–59 years	51	17.3	51	17.3	24	8.2	168	57.1	294
60–69 years	50	18.9	28	10.6	27	10.2	159	60.2	264
70–79 years	36	19.8	20	11.0	34	18.7	92	50.5	182
80–89 years	10	23.3	4	9.3	9	20.9	20	46.5	43
90 years and over	0	0.0	0	0.0	1	50.0	1	50.0	2
Totals/average	220	19.6	160	14.3	121	10.8	621	55.3	1122

Table 5
Relationship between examination type and positive prognostic factors based on 1222 fully staged primary breast cancers including DCIS (1240 diagnosed)

Exam type vs. prognosis	Poor	Percent	Fair	Percent	Good	Percent	Best	Percent	Totals
All staged cases	220	19.6	160	14.3	121	10.8	621	55.3	1122
All symptomatic patients	183	37.7	71	14.6	93	19.2	138	28.5	485
All routine patients	36	5.7	88	13.9	27	4.3	483	76.2	634
Routine patients under 50 years	13	8.0	25	15.3	5	3.1	120	73.6	163
Only routine yearly	12	5.2	29	12.5	4	1.7	187	80.6	232
Only routine every 2 years	10	7.2	23	16.7	7	5.1	98	71.0	138

Table 6
Comparison of positive prognostic factors and diagnostic imaging procedures

Improved prognostic factors and imaging	1996	1997	1998	1999	2000	2001	2002	2003	2004
Women 35 years and over in Tyrol	172174	175053	178111	181500	183779	185267	187780	188927	189753
Total mammograms per year in Tyrol	58843	68017	76197	82257	83926	83365	96401	102086	
Mammograms/100 women 35 years and over	34.2	38.9	42.8	45.3	45.7	45.0	51.3	54.0	
Total breast ultrasounds per year in Tyrol	8519	10409	32575	41619	50471	56440	63607	69709	
Breast ultrasounds/100 women 35 years and over	4.9	5.9	18.3	22.9	27.5	30.5	33.9	36.9	
Percent tumor classification of pT1 and better	58.0	59.7	67.4	69.1	65.8	68.8	71.6	68.6	74.4
Percent lymph node negative including DCIS	54.8	62.5	67.1	61.7	66.7	64.6	60.9	61.7	69.5
"BEST" prognosis = TNM-stage1 and better	41.9	50.0	56.9	55.5	59.4	55.7	50.9	55.1	62.3
Percentage of sentinel node procedures			4.5	4.2	34.2	42.2	53.2	66.8	64.0
Percentage of breast cancers discovered routinely	40.6	42.9	53.9	53.1	47.5	55.4	55.0	54.9	62.2
Breast cancer deaths: 100000 women over 34 years	77.2	76.5	69.1	62.3	62.6	62.6			
Breast cancer deaths per year in Tyrol	133	134	123	113	115	116			

micro-metastases and 23.5% positive) now again indicate a continued increase in earlier stages.

3.4. Opportunistic early detection in Tyrol versus classic mammography screening

We have compared our results based on tumor classification and lymph node status with other published international studies (see Table 7 and Graph 4). The Swedish two county study [12] results represent the original patient-screening group started in 1977, which may explain the relatively low rate of DCIS in that group. The Canadian study [13] includes nationwide results from 1997 to 1998. The Vermont study [14] is a comparison review of the time periods 1975–1984, 1989–1990 and 1995–1999. The results in the table for Vermont represent extracted data for the most recent 1995–1999 group and are a combination of routine and symptomatic patients. Vermont with a similar population to Tyrol also has

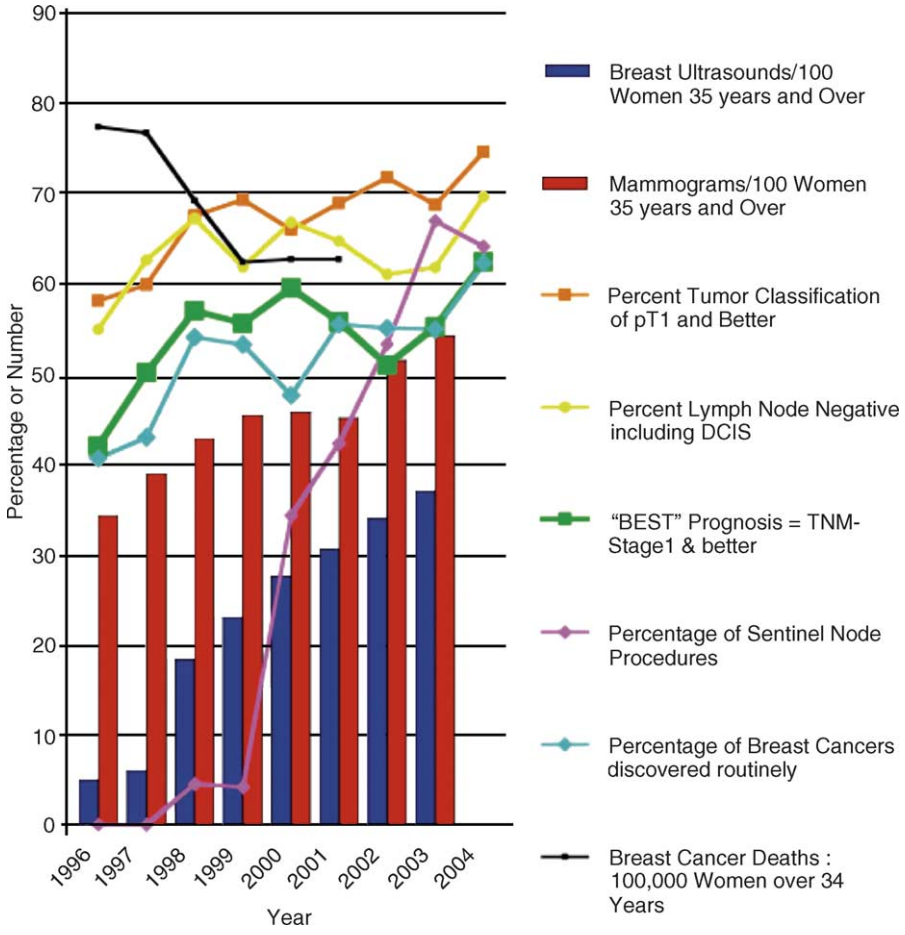

Plate 3. Comparison of positive prognostic factors and diagnostic imaging procedures.

Table 7
Comparison of our tumor classification and lymph node status results with international studies from Canada, Sweden and Vermont

Tumor classification	Tyrol problem	Tyrol "screening"	Canada screening	Sweden screening	Vermont mixed
DCIS	19	122	788	169	361
pT1	227	532	1583	1141	988
pT2	202	63	610	694	416
pT3 and pT4	112	3	985	182	84
Totals	560	720	3966	2186	1849
Cases with pT1 and better	246	654	2371	1310	1349
Cases with pT1 and better (%)	43.9	90.8	59.8	59.9	73.0
Axillary lymph node status					
Lymph node positive cases	274	128	551	693	360
Lymph node negative cases	195	378	2136	1324	513
DCIS cases	19	122	788	169	211
Total lymph node staged cases	488	628	3475	2186	1084
DCIS and lymph node negative	214	500	2924	1493	724
DCIS and lymph node negative (%)	43.9	79.6	84.1	68.3	66.8

no organized mammography-screening program and relies rather on a similar opportunistic system with a centralized data collection system (Vermont Breast Cancer Surveillance System). Our results for symptomatic patients are listed in column 1, those for routine examinations ("screening") in column 2. The results represent totals for the past 9 years, thus veiling the progressive improvement over time (see above). Our 90.8% rate of cancers classified as pT1 and better for routine ("screening") cases supercedes all published studies and can at least in part be explained by the liberal use of breast ultrasound in most patients, especially those with dense breast tissue.

Lymph node negative status (DCIS plus invasive cancers) for our routine ("screening") cases (79.6%) is higher than the older Swedish study (68.3%) but lower than the more recent Canadian study (84.1%). There is however an unexplained discrepancy in the Canadian results. This rate is unrealistic considering that only 59.8% (2371 of 3966 cases) of their cases were classified T1 or better. This is probably related to how many lymph nodes are removed and how closely the pathologist examines these lymph nodes [15]. Our surgeons remove a minimum of 10 axillary lymph nodes and our pathologist macroscopically cuts each node into 2 mm slices and generates at least four specimens of each slice. Thus, a 1 cm thick lymph node is examined with 20 sections (every 500 μm). With the advent of sentinel node examinations the evaluation is even more intense including immune histo-chemical analyses, which has resulted in an increased positive rate, especially micro-metastases.

4. Discussion

The percentage of all occurring breast cancers actually found routinely or with screening-mammography is of major import. Our routinely discovered cancers have a 76.2% chance of being TNM-stage 1 or better as opposed to only 28.5% for symptomatic cancers (see above). This rate is the best measurement of the effectiveness and quality of the entire system. A recent study from Finland [16] reports that only

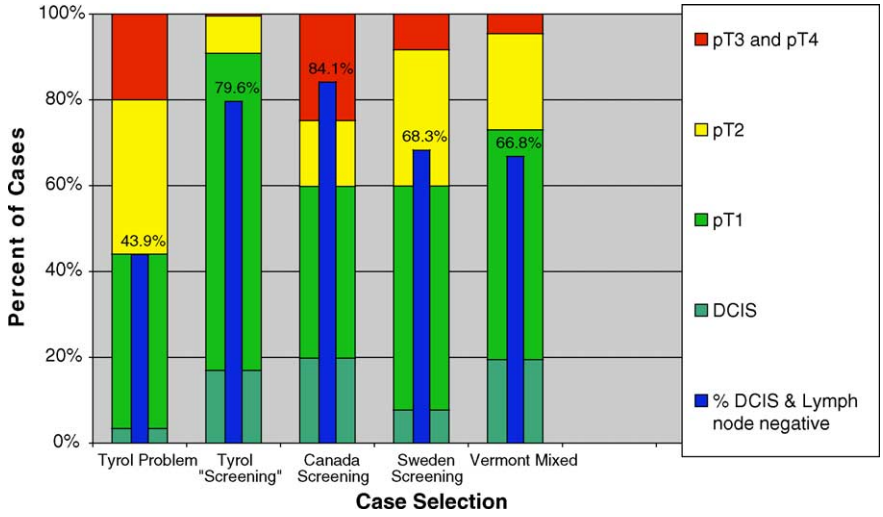

Plate 4. Comparison of our tumor classification and lymph node status results with international studies from Canada, Sweden and Vermont.

23.4% (443 of 1893 cases) of all occurring breast cancers were discovered through the screening program. This year 62.2% of our cases were discovered routinely. Illustration 1 is a mathematical model that could explain the discrepancy and indicates which results are actually achievable. Our target group is all women over 34 years examined yearly, Finland screens women between 50 and 69 years every 2 years. In our experience 96% of all breast cancers occur over the age of 34 years, but only 48% between 50 and 69 years. The combination of mammography and high-resolution breast ultrasound finds 99% of discoverable lesions, mammography alone only 84%. Interval cancers are more frequent in patients examined only every 2 years. The almost three-fold rate of breast cancers in Tyrol discovered routinely is the primary reason for the 62.2% rate of TNM-stage 1 or better disease for all patients in 2004 (i.e. routine and symptomatic)!

With the *exception of Austria* all (original) European Union member states have systematic mammography-screening programs or pilot projects:

1. Prim. H. Concin, himself an expert member for this project, presented a talk "15 years mammography-screening in Vorarlberg" at the 10th Alpine Workshop for Senology in Schladming, Austria on 7 March 2004. Vorarlberg is one of the nine Austrian states.
2. In Vienna a 2-year mammography-screening pilot project including the private radiologists was conducted between the years of 2001 and 2003 [17].
3. Our Tyrolean pilot project was begun in 1998 and our results speak for themselves.

Opportunistic versus screening	Tyrol	Opportunistic (%)	Finland	Screening (%)
Discoverable cases		100		100
Incidence in target group	All women over 34 years	96.0	Only women 50–69 years	48.0
Discoverable cases remaining		96.0		48.0
Patient compliance		75.0		85.0
Discoverable cases remaining		72.0		40.8
Examination type	Diagnostic including ultrasound	99.0	Pure mammography screening	86.0
Discoverable cases remaining		71.3		35.1
Interval cancers	14% by yearly examination	86.0	25% Screening every 2 years	75.0
Discoverable cases remaining		61.3		26.3
Iatrogenese imperfect	2%	98.0	2%	98.0
Theoretically discoverable cases		60.1		25.8
Actual rate		62.2		23.4

Mathematical model comparing the rates of discoverable breast cancers between opportunistic screening (Tyrol) and a pure mammographic screening program (Finland)

4.1. ÖBIG mammography-screening feasibility study statements

The three major goals of the proposed program are stated as:

1. Increased early detection of breast cancer, stage 1 or better: With 62.2% of all discovered cases now being diagnosed routinely with an average 76.2% rate of TNM-stage 1 or better lesions, we in Tyrol are fulfilling goal one better than any published pure mammography-screening program.
2. Lowering the mortality by 30–35%: This goal can as yet not be evaluated.
3. Improving quality of life though more efficient methods: A low rate of actually performed biopsies (42.9% malignancy rate) as well as the increases in minimally invasive breast biopsies (92.4%) usually with same day results through frozen-section diagnosis, sentinel node biopsies (64.0%), and breast sparing surgeries (80%) are just some of the quality of life improvements already in place at our breast centre for Tyrolean women.

Since the average age of breast cancer occurrence in Austria is 63 years (in Tyrol about 60 years) mammography screening should be performed between 50 and 69 years once every 2 years.

In the USA, breast cancer has become the leading single cause of death in women between 40 and 55 years of age. Our results (see Graph 2) indicate a rate of 1.50 primary breast cancers per 1000 women per year in the 40–49 year age group (66.1 total cases per year in Tyrol) as compared to 2.12 cases per 1000 women per year in the 50–59 year group (84.2 total cases per year in Tyrol). Limiting our target group to 50–69-year-old women screened once every 2 years without the benefit of breast ultrasound would severely decrease the number of discoverable breast cancers (see above mathematical model—Illustration 1).

These are obvious reasons for routinely examining women, including those below 50 years of age. As in Vorarlberg (personal communication from Prim. H. Concin), women under 50 years are most likely to follow our early detection recommendations. For us it is thus not surprising that this group shows an above average rate (74.2%) of pT1 and better cancers, an about average negative axillary

node rate of 62.7% and almost the highest rate (58.5%) of "BEST" prognosis—TNM-stage 1 disease and better (see Table 4). Most countries with longer experience in mammography screening (i.e. USA, Sweden, Italy) are progressively expanding their target group criteria: earlier begin, open-end screening, yearly examinations, addition of breast ultrasound, etc. In Tyrol this has already been done and our results affirm this decision.

5. Conclusions

The team approach to a patient and her breast cancer is the key to successful diagnosis, treatment, as well as the patient's survival and hopefully her cure. In the university environment most modalities and specialties are within easy reach. The difficulty is usually in overcoming turf battles. Of equal import or even more so is surmounting the ivory tower image and including the "outside" physicians as equal partners (team members). We have been able to achieve this to the benefit of all, especially the patient.

Our findings indicate that opportunistic breast cancer early detection in the Tyrolean environment with universal health care yields far better results than any of the classic pure mammography-screening programs. It also enjoys better patient and physician acceptance, which leads to better compliance. There has been an improvement in the prognostic factors in the form of progressive increases in smaller tumors, negative node status and the percentage of routinely discovered tumors between 1996 and 2004 in our observed patients. This parallels the increase in mammograms and breast ultrasound examinations performed in Tyrol over the same time period. We believe that these improvements are a direct result of the increased patient compliance with our breast cancer early detection recommendations and will definitely result in increased patient survival and cure. Further improvement could be best achieved by having all primary physicians impress the need and methods for early breast cancer detection upon their patients.

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