

## ARTICLE

### Medical Imaging and the "Borderline Gaze of Touch and Hearing": The Politics of Knowledge beyond "Sense Atomism"

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#### Abstract

This article traces different devices and practices (i.e., ultrasound scan, fine needle aspiration and breast examination) involved in the clinical diagnostic practices for breast cancer and suggests that they might be productively considered as “visualization apparatuses.” Drawing on auto-ethnographic data and medical literature, it explores how these apparatuses make visible and help materialize a particular bodily configuration (e.g., a simple cyst as a benign breast disorder). In examining side by side the practices and devices commonly characterized as medical imaging such as ultrasonography and the more mundane apparatuses such as syringes or trained eyes and fingers, the article draws attention to the non-given nature of image and imaging, and to the equally non-given nature of the distinctions between vision, touch and hearing as modes of sensing and knowing. In doing so, it seeks to problematize the traditional partitioning of experience into separate and separable perceptual and epistemological modalities, while at the same time reclaiming vision, touch and hearing as metaphors for responsible and accountable knowledge-making.

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Bringing together feminist (Haraway, 1988; Puig de la Bellacasa, 2009; Barad, 2007; 2012) and post-phenomenological (Ihde, 2007; Ingold, 2000) work on knowledge-making and perception with the concept of synesthesia (Harris, 2016; Hayward, 2010; Marks, 2002), it argues for a certain knowledge politics beyond “sense atomism,” which helps us to rethink not only the apparent distinction in the different sensorial universes but also, more broadly, the questions of knowledge, politics, responsibility and accountability.

## Introduction

[T]he medical gaze embraces more than is said by the word “gaze” alone. It contains within a single structure different sensorial fields. The sight/touch/hearing trinity defines a perceptual configuration in which the inaccessible illness is tracked down by markers, gauged in depth, drawn to the surface, and projected virtually on the dispersed organs of the corpse. The “glance” has become a complex organization with a view to a spatial assignation of the invisible. ...

The medical gaze is now endowed with a plurisensorial structure. A gaze that touches, hears, and, moreover, not by essence or necessity, sees. (Foucault, 2000, p. 164).

The medical gaze, the cornerstone of the sociological imagination of the relationship between vision, knowledge and embodiment in the space of the clinic (Foucault, 2000), has long been seen as linking the different sensoria within one perceptual and epistemological configuration. Michel Foucault speaks in this context of the local, “borderline gaze of touch and hearing” practiced by physicians (2000, p. 165). Applying his concept to the case of a computer tomography suite, medical anthropologist Barry F. Saunders notes how “looking comprises a multiplicity of gestures” (2010, p. 18). And yet, while other senses might be involved in its “plurisensorial structure,” the organizing principle of the gaze and of the clinic often appears to be that of a fundamental visibility concerned with the spatial arrangements of bodies (Foucault, 2000, pp. 164-165). The

practices and apparatuses of medical imaging seemingly contribute to this visual regime as they help produce particular reconfigurations of objects/bodies in terms of sets of images or image data (Prasad, 2005).

The materiality of these visual arrangements and the devices and practices which help to constitute them has been widely discussed; on the one hand, in the tracing of the conditions of development and production of particular imaging technologies (Joyce, 2006; Koch, 1993; Pasveer, 1989; Yoxen, 1987); and, on the other hand, in the careful articulations of the clinical practices in which they are involved (Joyce, 2005; Prasad, 2005; Saunders, 2010). Contrary to popular imaginaries, the visual in the clinic is not virtual; it does not make the patient and her embodied experience “disappear behind the images” (Blaxter, 2009, p. 764). Neither is it representational if we are to follow feminist science studies scholar Karen Barad’s understanding of representationalism as a metaphysical framework separating the world into “the ontologically disjoint domains of words and things” (2003, p. 811) or “representations” and “ontologically separate entities awaiting representation” (2007, p. 49). As she notes in her discussion of fetal ultrasonography, the apparatus “does not allow us to peer innocently at the fetus, nor does it simply offer constraints on what we can see; rather it helps produce and is part of the body it images” (2007, p. 202). In this context, the fetus and the ultrasound image are not separate entities but rather parts of an ontologically inseparable phenomenon constituted in the intra-action of the “object” and the “agencies of observation.”<sup>1</sup>

Following Barad’s understanding of apparatuses as “instrument[s] of power through which particular meanings and bodies and material-discursive boundaries are produced” (2001, p. 80),<sup>2</sup> in this article I want to trace different devices and practices (i.e., ultrasound scan, fine needle aspiration as well as breast examination and self-examination) involved in the clinical diagnostic practices for breast cancer and to suggest that they might be productively considered as “visualization apparatuses.” I use this term to refer to these instruments, technologies and practices, which have power to render objects/bodies visible, that is, observable

and knowable, but – importantly – only as part and parcel of their own apparatus. These “visualization apparatuses” and the notion of visibility they entail can be seen to encapsulate different optical systems (embodied or otherwise), and the possible configurations of images or image data. But, crucially, they need to be understood also in relation to other perceptual systems and other types of data.

Drawing on auto-ethnographic work, on oncological and radiological literature and on feminist science studies and post-phenomenological accounts of sensory perception and knowledge, I want to explore how the three biomedical apparatuses (i.e., ultrasound scan, fine needle aspiration as well as breast examination and self-examination) make visible and help materialize a particular bodily configuration of which (importantly) they are part: a simple cyst, a benign breast disorder. By examining side by side the practices and devices commonly characterized as medical imaging, such as ultrasonography, and the more mundane apparatuses, such as syringes or trained eyes and fingers, I want to open up for inquiry two important issues related to visualization and its apparatuses.

Firstly, I want to draw attention to and problematize the notion of medical imaging technologies as given and predefined objects or entities. The non-givenness of imaging technologies needs to be understood not only by recognizing that, as “apparatuses of observation” in the sense suggested by Barad (2003, p. 815), these technologies are not separable from their objects of investigation but rather intra-actively materialized together with these objects. The non-givenness of these technologies needs also to be understood in terms of acknowledging that, as the objects of inquiry, they are not separable from the specific practices, in which they are located, including our analytical practices. Imaging has sometimes been defined as relating to specific technologies and practices involved in the configuration of images (see, for example, Papenburg et al., 2015). In this article I want to explore the broader genealogies of three different medical apparatuses, and investigate how some of them (i.e., the ultrasound and its digital display) come to be

included in the biomedical imaginary of imaging, while the other (i.e., needles and syringes in fine needle aspiration, or eyes and fingers in medical examination) come to be excluded. In the process, I also want to explore what specific modes of sensing and knowing are involved in making these differentiations.

This last question brings forth the second and central concern of the article. By bringing together these diverse practices and apparatuses, I want to explore and problematize the relationship between vision, touch and hearing as modes of sensing and knowing in biomedicine. In various diagnostic practices for breast cancer, seeing might be understood as always already dependent on different forms of hearing and touching with/in different bodies, both human and non-human (as sonic waves are transduced into electronic ultrasound images; or as the suction of a syringe in fine needle aspiration draws out and makes visible bodily fluids); touch might also be a “listening-touch” (Harris, 2016) (as piezoelectric crystals of an ultrasound transducer vibrate in response to electric currents and ultrasonic waves), and both can be understood as visualizing devices, or “haptic-optic” systems (Hayward, 2010, pp. 580-581), which help render particular bodies and particular bodily conditions (such as a simple fluid-filled breast cyst) visible and intelligible. This insistence on the problematic distinctions between vision and touch, touch and hearing, and vision and hearing is not meant to suggest that biomedical practices and apparatuses are simply multisensory, nor that the different sensoria are indistinguishable as modes of perception. Rather it suggests that vision, touch and hearing, as modes of sensing and knowing, cannot be taken for granted, as already given, distinct from one another, and from the phenomena, which they render knowable, but are more appropriately understood as such in particular instances of seeing/touching/hearing/knowing and in relation to specific practices and apparatuses.

In this article I therefore seek to problematize the traditional partitioning of experience into separate and separable perceptual and epistemological modalities while at the same time reclaiming vision, touch

and hearing as metaphors for responsible and accountable knowledge-making. Drawing on the feminist tradition of situated knowledges (Haraway, 1988) and response-ability (Barad, 2007; 2012) and on non-atomist (Ihde, 2007; Ingold, 2000) or synesthetic understandings of sense and experience (Harris, 2016; Hayward, 2010; Marks, 2002), I want to argue for a relational understanding of sensory experience and the related conception of knowledge politics beyond “sense atomism.”<sup>3</sup> Bringing together the feminist and post-phenomenological work on knowledge-making and perception with the concepts of synesthesia, I suggest, can help us to rethink not only the apparent distinction in the different sensorial universes but also, more broadly, the questions of knowledge, politics, responsibility and accountability.

### Knowledge Politics of Vision, Touch and Hearing

As noted by Maria Puig de la Bellacasa, feminist theorist of science and technology, vision has been “the dominant metaphor in modern knowledge-making and epistemologies” (2009, p. 298) and, as such, subject to much feminist critique. The key point for this critique has been the traditional linking of vision with a particular version of objectivity, what Donna Haraway (1988) calls the “god trick” (pp. 581-582), an epistemological orientation marked by the disengaged view “from everywhere and nowhere” and by the absolute separation of the viewing subject from the object of its conquering gaze. The reclaiming of vision both as a metaphor and as a specific field of sensory experience is the fulcrum of Haraway’s argument for situated knowledges (1988). Wrested away from the illusions of disembodiment and transparency, vision can no longer be conceptualized as single or totalizing but rather as splintered into partial perspectives which are always finite and locatable and never innocent: “Vision is *always* a question of the power to see – and perhaps of the violence implicit in our visualizing practices. With whose blood were my eyes crafted?” (pp. 585, emphasis in original). The embodied and located vision of situated knowledge does not remove or

negate this violence; instead, it allows us to become accountable for it, “answerable for what we learn how to see” (p. 583). This vision is best characterized by the optics of diffraction rather than that of reflection, concerned as it is with “the production of difference patterns in the world, not just of the same reflected – displaced – elsewhere” (Haraway, 1997, p. 268).

Following Haraway’s project of re-appropriating vision for feminist knowledge politics, Puig de la Bellacasa (2009) turns to touch as the foundation of situated and committed knowledges. Tracing the move from vision to what she calls “touching visions” in feminist theorizing, she explores the potential of touch in problematizing “abstractions and disengagements of (epistemological) distances – between subjects and objects, knowledge and the world, affects and facts, politics and science” (p. 298). In this context, touch appears to be linked with the fuller recognition of the matters of embodiment, relationality and engagement. The reversibility of touching contact, the possibility of “being-in-touch-with” oneself and another, of being materially involved with/in the tangible world in its ongoing transformations – these seem to be the promises of touch as a sensorial universe and as a metaphor for knowledge-making. But, as Puig de la Bellacasa suggests, turning to touch does not mean replacing the illusions of distance and transparency with those of the embodied, unmediated immediacy. Situated knowledges reclaiming touch, just as those re-appropriating vision, are not immune to injustice or violence; they give no assurances of final resolution, rather they open up spaces for accountability. As Barad notes: “Touch is never pure or innocent. It is inseparable from the field of differential relations that constitute it” (2012, p. 215). Touching involves a response to the other, where the other and the self are not already given but constituted in mutual “response-ability.” Touch is thus a matter of responsibility understood not as an obligation of the self toward the other but as a relation integral to the ongoing worldly materializations within which the self and the other are articulated and materialized (Barad, 2007, p. 265). It is the responsibility for these articulations and materializations, for the

material consequences of our world-shaping (touching) visions, that marks feminist knowledge politics.<sup>4</sup>

The feminist projects of reclaiming vision and touch have been paralleled by the anthropological and post-phenomenological work revaluing the significance of hearing as a mode of sensing and making sense of the world (Ingold, 2000; Ihde, 2007; Rice, 2008). The “auditory turn” (Ihde, 2007) has looked to sound and hearing as a way for a more participatory and relational engagement between subjects and objects: listening to the voice of the other, giving voice, being immersed in a shared stream of sound, traversing the boundaries of inside/outside. As touch before, hearing seems to suggest the possibility of redressing the distancing and objectifying orderings of vision: “[T]here is an old and deeply held tradition that vision ‘objectifies’, and, contrarily but not so widely noted, there is also a tradition which holds that sound ‘personifies’” (Ihde, 2007, p. 21). And yet, for Don Ihde and Tim Ingold, this turn to sound and hearing is not meant to idealize the auditory experience but rather to draw attention to the problematic understandings of experience, perception and knowledge as implied by the dominant visualist tradition. This tradition, according to Ihde, introduces a certain “sense atomism” (2007, p. 46), which, firstly, conceptualizes experience in terms of distinct and separable sensory systems and, secondly, enacts a radical break between sense and significance, between perception and cognition. As Ingold explains:

At the heart of this approach is a representationalist theory of knowledge, according to which people draw on the raw material of bodily sensation to build up an internal picture of what the world “out there” is like, on the basis of models or schemata received through their education in a particular tradition. The theory rests on a fundamental distinction between physical and cultural dimensions of perception, the former having to do with the registration of sensation by the body and brain, the latter with the construction of representations in the mind. (Ingold, 2000, pp. 282-283)<sup>5</sup>

He further argues that it is only through this “narrow conception of thought” (p. 287) that vision had come to be seen as an objectifying sense and thus opposed to the seemingly more participatory mode of hearing. Drawing attention to sound and hearing opens up a possibility for intervening into this limited understanding of vision and knowledge. The “auditory turn” thus constitutes not only the reclaiming of sound and hearing, but also the reclaiming of vision as a field of sensory experience, and as a metaphor for thought.

### **Knowledge Politics beyond “Sense Atomism”**

Crucial for Ihde’s (2007) and Ingold’s (2000) understanding of knowledge and perception is the resistance to “sense atomism” or the partitioning of experience into separate and separable modes of sensing.<sup>6</sup> Drawing on phenomenological understandings of experience, these authors suggest that in the actual sensory and perceptual practices seeing, touching and hearing are not distinct activities but intermingled aspects of the bodily engagement with/in the world. This problematic separation of the different modes of sensing has often been illustrated by the phenomenon of synesthesia, that is, the capacity to perceive a sensation related to a particular sensory modality in response to a stimulation of another (e.g., seeing certain forms or colors on hearing particular sounds). As Ingold (2000, p. 268) notes, the very category of synesthesia relies on and further reproduces “a two-fold distinction between sensation and perception on the one hand, and between discrete sensory modalities on the other.” But, as illustrated by such synesthetic concepts as “haptic visuality” (Marks, 2002), “fingeryeyes” (Hayward, 2010) and “listening-touch” (Harris, 2016), the notion of synesthesia nevertheless introduces the possibility of disrupting these distinctions, and in doing so, contributes to a non-atomist, non-representationalist, response-able politics of knowledge.

Media theorist Laura Marks uses the concept of “haptic visuality” to trouble the separation between vision and touch. On her account,

haptic perception, “the way we experience touch both on the surface of and inside our bodies” (2002, p. 2), forms part of the visual experience of cinema. This entails a certain embodied and tactile vision where the eyes act as organs of touch, feeling as well as seeing the textures of the cinematic image. Haptic visibility is thus constituted through particular forms of images, “haptic images,” but also, and more importantly, in the reconfiguring of the relationship between images and their viewers, between the objects and subjects of the gaze:

Haptic images do not invite identification with a figure so much as they encourage a bodily relationship between the viewer and the image. Thus it is less appropriate to speak of the object of a haptic look than to speak of a dynamic subjectivity between looker and image. (p. 3)

Eschewing identification in favor of an embodied, dynamic relationality, haptic visibility thus seems to follow the diffractive optics of situated (touching) visions.

Following Marks’s concern with haptic optics, feminist science studies scholar Eva Hayward proposes a notion of “fingeryeyes” as a way of attending to the “synaesthetic quality of materialized sensation” (2010, p. 580). But, her concern is not as much with the relationship between the viewer and the image as with the possibilities of sensing across different sensoria, different media and, most importantly, different species. Looking at the laboratory encounters of marine biologists and their critters, Hayward suggests that vision and touch are not separate or separable but remain in the relationship of “constitutive complementarity,” which is expressed in and generates particular textures of the world (p. 582). In this understanding of sense and sensory experience, the eyes and the fingers and, equally, the tentacles, are not seen as distinct organs of perception but rather as inseparable from (within) the body’s sensorium. Vision and touch are amalgamated and slide into each other as fingers and eyes and tentacles converge in moments of sensitization. Importantly, in these instances of sensing, species do not simply react to one another and to their environment, rather they manifest “with and of”

the environment and the other, thus constituting “a sensorial ensemble” (p. 593). The notion of “fingeryeyes” thus troubles the sensory, bodily and species boundaries while also hinting at the power relations inherent in the embodied haptic optics:

Cross-species sensations are always mediated by power that leaves impressions, which leaves bodies imprinted and furrowed with consequences. Animal bodies – the coral’s and mine – carry forms of domination, communion, and activation into the folds of being. (p. 592)

As such, it calls forth and makes space for response-ability in sensing and knowledge-making.

Coming from the field of medical anthropology, Anna Harris’s concept of “listening touch” offers parallel insights into the distributed nature of sensation and the permeability of bodily boundaries (2016). Exploring the ways in which medical students are taught and acquire the skills necessary for the clinical technique of percussion, she suggests that listening and touch are not confined to and experienced through their respective organs of the ears and the fingers, rather they constitute a form of “body-listening touch” (p. 42). As the training physicians pay attention to the pitch as well as the vibration of the percussed bodies, the auditory and tactile experiences become intertwined within the movements of the sensing body: “Listening-touch in percussion is not a single moment. As the finger-hand-wrist moves, the ear anticipates. The body works in coordination and listening-touch is distributed throughout the technique” (pp. 37-38). Interestingly, for Harris the concept of “listening-touch” problematizes not only the distinction between touch and hearing. Similarly to haptic optics and its diffractive touching visions, it also helps to trouble the separation between the subjects and objects of perception, as (in the case of self-percussion, an important technique for clinical training) the percussing bodies also become the resonating ones.

The synesthetic notions of “haptic visuality,” “fingeryeyes” and “listening-touch” contribute to a conception of knowledge politics beyond

“sense atomism” as they challenge the representationalist and individualist – in the sense suggested by Barad (2003, 2007), Ingold (2000) or Ihde (2007) – metaphysical approaches which separate subjects and objects of perception and divide sensation into distinct domains of different senses and their respective organs. These concepts do not simply imply that perception is multisensory or multimodal; they also indicate the inherent intra-activity of sensory practices which are also, importantly, knowledge practices. Writing about the “robotic tactility” feminist science studies scholar Claudia Castañeda (2001) suggests that touch cannot be understood in any general abstract terms as a given. Rather it needs to be seen as constituted through particular embodied relations, particular encounters between bodies and worlds, where touching bodies and the nature of their relation are not already established “in advance of an encounter” but are materialized through them (p. 230). The notions of “haptic visuality,” “fingeryeyes” and “listening-touch” extend this understanding of touch into other modes of sensing and knowing. In this view, seeing, touching and hearing need to be conceptualized – to paraphrase Castañeda’s words – as relational qualities that arise out of embodied intra-actions. As I will argue in the following parts of the article, this has important consequences for our understanding of medical imaging technologies and other diagnostic “apparatuses of observation” (Barad, 2003, p. 815) not as already given but as intra-actively constituted in particular instances of seeing/touching/hearing/knowing, which also importantly help determine what comes to be understood as vision, touch and hearing in biomedicine. What follows is the discussion of the three different “visualization apparatuses” involved in the clinical diagnostic practices for breast cancer (ultrasound scan, fine needle aspiration as well as breast examination and self-examination). This discussion draws on various sources of data, including auto-ethnographic field notes, patient information leaflets, radiological and oncological literature, and historical and philosophical accounts of different imaging technologies.<sup>7</sup>

## Imaging Bodies, Imagining Vision

Dark room, lying on the bed, half turned toward the ultrasound screen and the doctor who stands next to it. Cold gel on the breast and the sensation of the transducer probe moving over the skin, coming back to the same place over and over again. Not looking at my breast but at the screen, where more than fifty shades of grey are swirling. Among the grey and greyish, the blackish spots move. Is it what the doctor is looking for? Yes, this is a cyst, the doctor says. Do you want me to drain it off today?

Again the greyish swirls on the screen, the blackish spots among them. A sharp scratch now, says the doctor. The sharp stinging sensation in my breast, but still I am not looking there. I look at the screen. And, suddenly, a thin long shape in the lighter shades of grey moving through the swirls. This is a needle, I think to myself. The greyish shape meets with one blacker spot, then another, and both of them vanish. Ah, these are the cysts. Then, the thin shape disappears from the screen too. Only the grey swirls remain. The needle has been taken out. It is now drained, the doctor says. Were there one or two cysts? I ask. Two, he confirms. Ah yes, I could see it on the screen, I say, proud of being able to “read” the scan correctly. So it was only some fluid? Yes, look, it’s here, the doctor says and shows me the syringe with a yellowish fluid inside. So, these are the cysts too. You can touch your breast and see that it’s gone now, the doctor says. Obediently, I touch my breast, but I am worried to press too hard in case it hurts. Full of tension and apprehension I cannot say whether I sense any change. Still, not to disappoint the doctor I say: Oh, yes, it’s gone. Thank you!

This scene in the dimmed clinical room with the ultrasound machine at its center is one among several episodes constituting my encounter with diagnostic practices for breast cancer. It takes place on an early evening

in late January 2016, almost three months after my discovery of a suspicious lump in my left breast and an urgent visit to my local GP, resulting in a non-urgent referral to the breast clinic at a large teaching hospital in Scotland. The setting for this scene is disturbingly familiar, even if the circumstances are not: a few years earlier I had spent long hours in the rooms and corridors of the same out-patient department, not as a patient but as an ethnographer following a group of men diagnosed with prostate cancer. This does not prepare me for being the subject of the clinic's gaze, but it makes me aware of its various "apparatuses of observation" which help to render particular bodily arrangements determinate as cancerous or non-cancerous.

A brief information leaflet received together with my letter of appointment tells me that "the Breast Clinic has been designed to provide a diagnostic service" for my "breast complaint," that "certain procedures may have to be performed" in different rooms within the clinic, that I may "need to spend three to four hours at the clinic before a final result is available," and that during this time I will be seen by "the doctor" while nursing staff – including a breast-care nurse specialist – will also be present. The leaflet suggests the breast clinic is a complex matter: an arrangement of different practices, apparatuses and relations involving different human and non-human participants, including clinical staff, spaces and technologies. What it does not reveal is the extent of the world-making capacity of these practices and apparatuses. Over the course of just a few hours the breast clinic helps to make visible and materialize a particular bodily configuration: a simple, fluid-filled cyst in my left breast now successfully drained and therefore conclusively determined as a benign rather than malignant lesion.

Leafing through oncological and radiological literature, I learn that the majority of breast lesions are in fact benign (Guray & Sahin, 2006); simple cysts are by far the most common among them (Berg, Sehtin, Marques, & Zhang, 2010). As one oncology article notes: "Cysts occur predominantly in the middle and late reproductive period, increasing in frequency from 35 years to a maximal incidence between 40 and 50

years” (Courtilot et al., 2005, p. 329). I have only recently reached the lower limit of this age range, but I am already in the company of nearly one-in-three women between the age of 35 and 50 who present with a cyst. I am also in a more select group of 20% to 25% of cases of simple cysts which involve “palpable (gross) cystic change” (Guray & Sahin, 2006, p. 438).

The exact causes of cysts like mine are not known, but there might be some links with the hormonal changes during the menstrual cycle and the excess of estrogen in the body. I learn this from a brief conversation with the doctor at the clinic and from a leaflet he has given to me. But cysts have also been characterized as disorders of lobular involution thus making them part of the “normal” processes by which the breast epithelial tissue is gradually lost due to aging. The formation of cysts is here seen as a result of the excessive secretion of the epithelium and the subsequent dilation of a terminal ductal lobular unit, the basic functional unit of the breast (Courtilot et al., 2005). The two cysts in my left breast might have formed in this way although – as I learn from another oncology source – the pathogenesis of cyst development is still poorly understood (Vargas et al., 2004). But the way in which cysts materialize and become visible in the breast clinic in the form of fluid-filled structures relies on a number of “visualization apparatuses.” The ultrasound machine and its particular ways of seeing and making visible is one of these apparatuses.

As I read in a medical textbook on breast imaging:

The most common sonolucent mass in the breast is the simple cyst. To make an accurate diagnosis of a benign cyst, strict criteria should be observed. Cysts should have sharply defined walls.

They may be round, ovoid, or lobulated and appear solitary or in groups. Cysts should have no internal echoes. (Kopans, 2007, p. 585)

“Sonolucent” is a term used in ultrasonography to describe that which allows a through-transmission of ultrasonic waves without reflecting them back to their source, that is, without producing any echoes. In practice,

and very much against its etymology (Latin *sonus* “sound” and *lucere* “to shine”), this term is used to characterize these areas of the ultrasound image that appear black and non-reflective, rather than bright with the reflected sound waves. These are the (silent) black spots among the (echoing) grey swirls.

The complex genealogies of ultrasonography have been widely acknowledged: from its roots in the developments of military sonar and radar technologies through its early applications in medicine, where it focused on therapeutic rather than diagnostic uses, to its particular implications for female bodies and subjectivities both in the testing of its early apparatuses on breast cancer patients and in its ongoing, pervasive use in obstetrics (Cartwright, 1992; Duden, 1993; Koch, 1993; Mitchell, 2001).

What has also been noted is the particular, non-optical nature of its vision (Barad, 1998; 2007). Ultrasound imaging does not rely on the properties and behavior of light; its seeing and making visible is instead dependent on the emission, reflection and absorption of the high frequency sound waves transmitted to a body through the direct contact with a transducer, converted into electric currents, calculated by a computer and, finally, displayed in a visual form as a two- (or three- or four-) dimensional image. This – in the words of sociologist of science Edward Yoxen (1987) – is “seeing with sound” (p. 281). But, equally, it could be considered a form of “listening-touch”: as the ultrasound transducer slides over a gel-covered body, its piezoelectric crystals vibrate in response to the electric currents and to the ultrasonic waves which pass through and are diffracted by the tissues. This way of imaging through sound and touch, which displays sonographic data in terms of spatial relations between differently echoing tissues, owes much to medicine’s earlier visual traditions, such as X-ray imaging (Koch, 1993) and anatomical drawings of the cross-sections of different body parts (Yoxen, 1987). But, as the history of ultrasonography suggests, this way of imaging was not the only one possible or even considered. The early ultrasonic devices developed by John Wild and tested on women with

different breast lesions presented sonographic data in reference to their different acoustic behaviors as plotted on a diagram (Koch, 1993) and, as such, did not contribute as easily to the imaginary of a body opened up for visual inspection.

For, as Barad (2007) has importantly noted, the ultrasound does not simply allow us to peer at or into the body; rather “the marks on the computer screen (the sonogram images, sonic diffraction patterns translated into an electronic image) refer to a phenomenon that is constituted in the intra-action of the ‘object’ ... and the ‘agencies of observation’” (p. 202). The ultrasound makes the cyst visible but only as a part of its own apparatus, as a sonolucent spot, visualized through electric transformations of sound waves into a digital image. Deferred from the sonic diffraction patterns, the cyst can only be seen and known diffractively through its variously materialized effects. What is also materialized and constituted in this process of transduction and translation of sonic data into a particular configuration of image data is the notion of ultrasonography as an imaging technology and a form of seeing rather than touching or hearing. The same cannot be said of some other apparatuses within the breast clinic, such as fine needle aspiration and breast examination, which contribute to the materialization of the fluid-filled structures in my left breast.

The lights are still dimmed, but the doctor is gone, the examination now concluded. Shedding quickly the baggy hospital gown, open at the front and so large it can wrap almost twice around my body. What should I do with it? I ask the nurse. Just leave it here, she says. She takes the syringe still half-filled with the yellowish fluid. Will you have to send it for further testing? I ask her. No, it is not necessary in case of a cyst, she says and places the syringe in a yellow plastic container for the medical waste.

The draining of the fluid from my breast is technically called fine needle aspiration. As I read in a paper published in *American Journal of Radiology*:

Aspiration may be performed [in the case of simple cysts] if the

patient is symptomatic or if the cyst prevents adequate compression for mammography. Aspirated fluid is typically not sent for cytology if it is cloudy yellow or green because of high false-positive rates. The fluid is sent for cytologic evaluation if it is bloody or if the patient requests that the aspirate be tested (Hines, Slanetz, & Eisenberg, 2010, W122).

The discarded syringe and its liquid contents are seemingly incidental, even immaterial, for the imaging of the breast lesion, excluded as they are from further mattering in the diagnostic practices of the breast clinic, and therefore from its vision. There is no use for the drained fluid, no need to test it. Furthermore, as suggested by the medical literature and the doctor's question as to whether I want the cyst drained off, there is even no need to perform the procedure in the first place. In my case the draining of the cyst is not meant to confirm a seemingly already certain diagnosis but rather to remove the discomfort and disquiet of a symptomatic patient. And yet, the syringe half-filled with a yellowish fluid is also highly consequential, as it constitutes a powerful visualization of the simple cyst, its liquid form made apparent. Fine needle aspiration can be seen in this context as a haptic optic system. As the needle pierces the flesh guided by the "listening-touch" of the ultrasound and its diffracted vision, as the plunger slides up the syringe its suction draining the fluid, the procedure reveals to the eye what the ultrasound has already seemingly made visible: a black, sonolucent spot on the ultrasound display as the effect of the high-frequency sound wave moving through the non-reflective, anechoic fluid of a simple cyst. It is by this act of draining, which makes it disappear from the ultrasound display (and thus from the clinic's diagnostic field of vision), that the cyst can finally be materialized and seen as just that: a simple water-filled nodule, the absence of which can be inspected and felt – just as its earlier presence had been – by skilled hands.

Lying on the bed, a room with strong lights. My arms above my head. The breast-care nurse is touching my breasts. Yes, there is something here, she says examining my left breast. It feels like a

cyst, perhaps a fibrocystic matter, but it is absolutely benign, it is nothing malignant. What would it feel like if it were malignant? I ask. What do you mean? she asks me back. How does a cancerous lump feel? It is hard and craggy, with little arms and legs coming out of it. This feels round and soft, and mobile. This is a benign cyst.

This scene constitutes the very first episode in my encounter with the breast clinic and its diagnostic apparatuses. But it is not the first time I have undergone a physical examination for my breast complaint. Almost three months earlier, soon after I have become aware of the suspicious lump, a doctor and a nurse from my local GP practice determine that – while some harder areas can indeed be felt in my left breast – to their practiced hands they do not seem suspicious at all. Still, deemed expert in the knowledge of my body, I am referred to the breast clinic, although the referral is considered non-urgent. My self-knowledge is meant to be the result of being “breast aware,” that is – to quote a leaflet produced by the Breast Cancer Care charity – “getting to know how your breasts look and feel so you know what is normal for you” and, therefore, can be “more confident about noticing any unusual changes that may be a symptom of breast cancer” (2016, p. 11). In the breast cancer early-detection campaigns, breast awareness had superseded breast self-examination (BSE): “a regular, repetitive monthly palpation to a rigorous set method performed by the woman at the same time each month” (Thornton & Pillarisetti, 2008, p. 2119).

The genealogies of BSE and breast awareness are quite complex. While the idea of examining breasts for small lumps had been tentatively promoted throughout the first half of the twentieth century, the notion of BSE was introduced and gained momentum in the 1950s with the joint campaign by the American Cancer Society and National Cancer Institute (Lerner, 2001). Inspired by the success of the Pap smear for the early detection of cervical cancer, BSE was intended as a similarly life-saving screening method for breast cancer at the time when other techniques (such as mammography) were not yet fully developed. Controversial from

its very inception due to the often sexualized images of the female body used in its promotion, and the inducing of the fear of cancer among healthy women (Lerner, 2001), since the 1970s BSE has come under growing scientific scrutiny because it has been linked to the increased numbers of benign lumps identified and biopsies performed but not to the reduction in breast cancer mortality and morbidity (Thornton & Pillarisetti, 2008). Deemed harmful to women and burdensome to health services, BSE has since been largely rejected in favor of breast awareness the clinical benefits of which are still debated, but which, nevertheless – as evidenced by the Breast Cancer Care leaflet – is currently encouraged as a cancer-screening tool among so-called “well women” (Thornton & Pillarisetti, 2008).

In contrast to the rigorous palpation of BSE, being breast aware means assessing both tactile and visual cues, looking not only for lumps and swellings inside the breast but also for any changes in its outward appearance. In fact, out of the eight changes that should be looked for, according to the Breast Cancer Care leaflet (2016, pp. 13-14), only two (“a lump or area that feels thicker than the rest of the breast” and “a swelling in your armpit or around your collarbone”) refer to symptoms that could be experienced specifically through palpation while the remaining six (“a change in size or shape” of the breast; “a change in skin texture such as puckering or dimpling”; “redness or a rash on the skin and/or around the nipple”; “your nipple has become pulled in or looks different”; “liquid that comes from the nipple without squeezing”; and “pain in your breast or your armpit that’s there all or almost all the time”) rely on various sensory signals, including a more general sensation of pain. Despite that, through genealogical links with its discredited predecessor BSE, the practice of breast awareness and its role in early cancer detection is still considered predominantly in terms of “touching and finding” (Thornton & Pillarisetti, 2008, p. 2119), rather than seeing or making visible.

In the breast clinic, the physical examination precedes the ultrasound scan and the fine needle aspiration. In some cases (but not in

mine), it might be all that is required. As the trained eyes and hands or, to use Hayward's (2010) term, "fingeryeyes," of the breast-care nurse trace the shapes and structures of my flesh, the lump in my left breast slowly materializes in a form intelligible to the breast service, and to me. No images or even image data are being produced here, but the hard mass in my breast is made observable and apparent as a benign rather than malignant condition. What is also made apparent (in fact, conspicuous by its absence) is breast cancer. I am fascinated by the imaginary of a hard, craggy, tentacled entity brought forth by the haptic optics of physical examination. And I wonder what careful practices have taught the nurse to see and feel and render visible and knowable the craggy body of the cancer and the round soft one of the benign cyst. Thinking back to my reading of the breast imaging textbook and its descriptions of simple cysts, not just as sonolucent spots but as round and sharply defined objects, I also wonder how other apparatuses, such as ultrasonography or mammography and various images produced as their part might be intra-actively brought together to make these imaginaries and their determination possible.

## Conclusion

Writing about technoscience and its "visual hermeneutics," Ihde (2009) describes imaging technologies as postmodern equivalents of the *camera obscura*, as they powerfully shape and make possible specific ways of visualizing and imagining the world. As he notes, these ways of seeing involve a reconfiguration of non-visual phenomena into visual ones by exaggerating "a kind of magnification/reduction distortion into monosensory dimensions" (p. 467), which obscures but does not eliminate the "whole body experience." In her reading of the *camera obscura*, and other versions of "the technological eye", Haraway suggests that the camera needs to be understood not only as "an analogy to the seeing eye in brainy, knowing man, for whom body and mind are suspicious strangers," but also, and perhaps more importantly,

in its etymological sense as “a judge’s chamber, in camera, within which the facts of the world – indeed, the critters of the world – are assayed by the standard of the visually convincing” (2008, p. 251). The feminist and post-phenomenological politics of knowledge have often treated imaging technologies as suspect. But they have also made apparent that no intervention is harmless and no way of knowing without its violence. With bodies handled, examined or punctured, exposed to the high frequency sound waves or electromagnetic radiation, determined as cancerous or non-cancerous, committed to life-changing, grueling treatments or excluded from them, what counts in the process of medical imaging is not without its material consequences. Writing about the history of breast cancer treatments, Barron H. Lerner (2001) notes the extreme violence of early surgical techniques, such as Halsted radical mastectomy or Wangenstein’s superradical mastectomy, and how screening and early detection programs would commit women with even small tumors to these life-changing procedures. S. Lochlann Jain’s (2013) anthropological accounts of contemporary “cancer culture” in America draw attention not only to the tremendous toxicity of many standard chemotherapy regimens but also to the widespread nature and severe consequences of delayed cancer diagnoses.

As I have argued in this article, imaging a simple cyst in the space of the breast clinic involves many different apparatuses and different ways of making bodies visible and knowable. Not all of these apparatuses are commonly considered as imaging technologies, and not all ways of making bodies visible in the clinic involve the production of images or image data. Certainly not all of them rely on optical arrangements for their vision. More often than not, the gaze of the clinic is also dependent on the “borderline gaze of touch and hearing.” As I have indicated, ultrasonography, a ubiquitous diagnostic apparatus and a common example of medical imaging technology, involves seeing with sound and sonic diffraction patterns which are translated into electronic images; but it also relies on the “listening-touch” of its vibrating piezoelectric crystals. Fine needle aspiration and medical examination,

excluded as they are from the imaginary of imaging, are differently configured haptic optic systems where the suction of the syringe draws out and renders visible an anechoic fluid and the skilled “fingeryeyes” of doctors and nurses materialize both benign and cancerous lesions.

Recognizing this synesthetic character of the clinical gaze and its apparatuses does not suggest that clinical diagnostic practices are simply multisensory, or that different perceptual systems are indistinguishable within a body’s sensorium. Rather it draws our attention to the non-given nature of distinctions between vision, touch and hearing as modes of sensing and knowing, and the equally non-given nature of imaging and its technologies. In doing so, it argues for a particular conception of knowledge politics beyond “sense atomism” which is grounded in non-representationalist, non-individualist understandings of sense and experience, and in feminist traditions of situated knowledges and response-ability. In this conception, seeing, touching and listening are understood not as predefined perceptual and epistemological modalities distinct from one another and from the phenomena that they render knowable, but – to paraphrase Castañeda (2001, p. 230) – as relational qualities that arise out of embodied intra-actions. What counts as vision as compared to touch and hearing, and what counts as image and imaging are not given in advance but articulated and materialized in specific practices and apparatuses which constitute particular instances of seeing/touching/hearing/knowing. In this context, responsible (and response-able) knowledge-making in biomedicine is not a matter of good scientific or clinical practice (if this is to be understood simply in terms of following some pre-existing norms or protocols), rather it is a matter of accounting for and remaining open to what diagnostic determinations are made, what ways of sensing and knowing are involved in making them and with what effects.

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## Notes

<sup>1</sup> Barad proposes the notion of "intra-action" to characterize the mutual constitution of objects, and objects and subjects within phenomena (2007, p. 33). Unlike "interaction," which assumes the existence of separate individual agencies prior to their relation, "intra-action" sees specific entities not as given but as emerging through their relations in the process of differential becoming.

<sup>2</sup> Barad's conceptualization owes much to Haraway's notion of an apparatus of bodily production as a material-semiotic, meaning-generating matrix which allows for the mapping and materialization of boundaries (1988), and to Bohr's understanding of measurement apparatuses as "macroscopic material arrangements through which particular concepts are given definition, to the exclusion of others, and through which particular phenomena with particular determinate physical properties are produced" (Barad, 2007, p. 142).

<sup>3</sup> The concepts of "situated knowledges," "response-ability," "sense atomism" and "synesthesia" are explained and further discussed in the following parts of the article.

<sup>4</sup> Donna Haraway emphasizes this notion of accountability and responsibility in relation to both touch and vision:

Touch, regard, looking back, becoming with – all these make us responsible in unpredictable ways for which worlds take shape. In touch and regard, partners willy nilly are in the miscegenous mud that infuses our bodies with all that brought that contact into being. Touch and regard have consequences. (2008, p. 36)

<sup>5</sup> This understanding of representationalism has some important parallels with Barad's conceptualization discussed earlier in this article.

<sup>6</sup> This understanding of “sense atomism” can be read as another version of what Barad refers to as the metaphysics of individualism, an ontological framework which sees the world as “composed of individual entities with individually determinate boundaries and properties” (2007, p. 107).

<sup>7</sup> The purpose and intention of including these various sources is not to tell a story of one patient’s encounters with the breast cancer services but rather to make particular theoretical points in relation to imaging and its technologies. As such, the events recounted in this section do not follow any chronological sequence but rather an internal logic of its theoretical argument.

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## Bio

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