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Incidental findings in CT angiograms for free DIEP flap breast reconstruction – Do they change our management?

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Abstract

Background: Abdominal CT angiography (CTA) has become an integral part of the pre-operative evaluation of patients undergoing free Deep Inferior Epigastric Perforator (DIEP) flap breast reconstruction. It aids accurate delineation of perforator anatomy, assists pre-operative decision making and reduces operative time. However, such detailed imaging invariably yields a variety of incidental findings, with quoted figures of 13–36% in this setting. The purpose of this study was to identify the rate of "incidentalomas" when using DIEP CT angiography and, review how such findings influence our management.

Method: A retrospective review was performed, looking at pre-operative scan reports of 154 consecutive patients undergoing free DIEP flap breast reconstructions between July 2008 and June 2012.

Results: Of 154 CTA's reviewed, 116 (75.3%) demonstrated incidental findings. In 71 patients (46.1%), these "incidentalomas" were inconsequential. However, in 37 patients (24.0%) the CTA prompted further investigations, and notably in a further 8 patients (5.2%) metastatic disease or other significant pathology was discovered which changed the operative plan.

Conclusion: The overall rate of "incidentalomas" presented in this study is substantially higher than other similar published series, and most importantly, significantly altered the surgical management plan in 5.2% of cases. As such we would advocate that a pre-operative "staging" CTA, imaging the chest, abdomen and pelvis is useful for more than just delineation of vascular anatomy in patients undergoing DIEP flap reconstruction.

Keywords: Breast reconstruction; DIEP; Free tissue transfer; Computed tomography; Angiography; Incidental finding

Introduction

In 1994 Robert Allen described the Deep Inferior Epigastric Perforator (DIEP) flap as an adaptation to the free Transverse Rectus Abdominis Myocutaneous flap (TRAM) for breast reconstruction.[1] Since then the DIEP flap has become an established alternative for post-mastectomy breast reconstruction. The DIEP flap is an autologous, free transfer of abdominal soft tissue, based on the perforators of the deep inferior epigastric artery. Large flaps can be harvested reliably on a single perforator dissected through the rectus muscle. This confers an advantage over the TRAM flap by providing a similarly natural looking reconstruction whilst preserving fascia and muscle, thereby reducing the functional impact to the abdominal wall. In particular, it has been found to minimize the risk of abdominal wall weakness or hernia,[2,3] as well as reduce post operative pain, thus resulting in a quicker recovery.[4] However, the DIEP flap is technically more demanding, requiring careful dissection of the perforating vessels through their muscular course, which can be time consuming, thus resulting in a longer procedure and hence potentially higher complication rates, including fat necrosis and flap failure.[3]

As a result, there has been a rise in interest in pre-operative mapping of perforator anatomy through the use

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of Doppler Ultrasonography, Colour Duplex Sonography, Computerised Tomographic Angiography (CTA), and Magnetic Resonance Angiography (MRA), which allow the surgeon to better understand the abdominal perforator anatomy.[5,6] This aids pre-operative decision making as imaging can assist in side selection for unilateral reconstruction and minimize the time spent identifying suitable perforators upon which to base the flap, as well as optimizing planning and execution of perforator dissection in cases with a long intramuscular course, thereby reducing overall operative time and complication rates.[7–10]

It has, however, been previously reported that such diagnostic imaging may lead to the discovery of a variety of incidental findings. The term "incidentalomas" has been coined in reference to such findings but what exactly constitutes an "incidentaloma" remains contentious and there are a number of studies reporting a wide range of incidentaloma rates (6–50%) in a variety of settings.[11–19]

Indeed, in their systematic review looking at a broad mix of patient groups undergoing diagnostic imaging, Lumbreras et al.[11] identified an overall incidentaloma rate of 31.1% following CT imaging. Similarly, rates of incidentalomas in whole body CT scans of trauma patients have been found to range from 33 to 50%.[12–14]

However, three studies reporting incidental findings in patients undergoing simulation scans for planning adjuvant radiotherapy in patients with breast cancer demonstrated much lower incidentaloma rates of only 6%, 11% and 16% respectively[15–17] whilst two recent studies of patients undergoing similar DIEP flap reconstructions report incidental findings of 13–36% based on their pre-operative abdominal CTA scans.[18,19]

Pre-operative CTA is the modality of choice for standard pre-operative imaging in our hospital, for patients undergoing DIEP flap reconstruction, however it was anecdotally noted by the authors that there appeared to be a much higher proportion of patients in our unit with incidental findings on CTA compared with published figures.

The aim of this study was thus to identify the actual incidence of "incidentalomas" in our unit to assess whether this was in keeping with reported figures and if not, to try to identify why our population group might have a higher rate of incidental findings.

Patients and methods

A retrospective study was carried out, reviewing all patients who underwent a planning CTA for immediate or delayed free DIEP breast reconstruction, under the care of the senior author, between July 2008 and June 2012, at North Bristol NHS Trust, United Kingdom. The pre-operative CTA reports were reviewed for all patients together with case notes and original histology reports, to provide data on the type of breast cancer and date of diagnosis.

The standard CTA planning for patients undergoing DIEP flap reconstructions at North Bristol NHS Trust follows a modified protocol including the thorax as well as abdomen and pelvis. This provides information on the internal mammary vessels for anastomosis as well as perforator mapping. If a patient has previously had invasive breast cancer and has not had CT staging in the last 6 months then our policy is perform a full staging protocol which includes pre- and post-intravenous contrast imaging of the liver in the portal venous phase, as well as arterial phase imaging of the thorax, abdomen and pelvis with fine overlapping slice acquisition, thus providing a 3D volume data set to allow multiplanar image reconstruction.

If the patient has never had invasive disease (either prophylactic mastectomy or mastectomy for DCIS only) then the scan is amended to just map the perforators and look at the internal mammary arteries and veins. This is a DIEP-timing arterial phase chest abdomen and pelvis without the extra supraclavicular and proximal femoral coverage. This second type of CTA is not classified as a true staging examination but because it does still cover chest, abdomen and pelvis it does also pick up significant incidental findings on occasion. All CTA scans were reported by a consultant radiologist, with a specialist interest in this area.

According to our protocol, any patients who were unable to have a CTA due to previous allergic contrast reaction would undergo an MRA instead, for the purposes of perforator mapping, but this does not provide further staging information and hence any such patients were excluded from this study.

Results

A total of 154 consecutive patients underwent pre-operative CTA, prior to reconstruction. The majority of patients were undergoing delayed reconstruction following invasive ductal carcinoma of the breast. However, a summary of the full range of histology results can be found in Table 1. Histology was retrieved for all patients, but in 6 cases it was not possible to retrieve the exact date and/or month of diagnosis, and only the year was known, thus for the purposes of interval calculations - these were taken to have been from 1st January of that year, in all cases.

Table 1
Primary breast histology.

Histology	Number of pts	Percentage (rounded to nearest decimal)
Ductal	96	62.3
Lobular	18	11.7
Other e.g. mucinous, small cell	2	1.3
Mixed e.g. ductal/lobular	9	5.8
DCIS[a]	21	13.6
ADH[b]	3	1.9
BRCA gene	5	3.2

[a] DCIS (Ductal Carcinoma in Situ).
[b] ADH (Atypical Ductal Hyperplasia).