Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study

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Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study

Author(s): Manenti A, Manco G, Vezzelli E, Donatiello S

Abstract

25 cases of left colon anastomosis, complicated by an early post-operative leakage, have been studied by Computed Tomography (CT); in 20 of them an arterial vascular insufficiency was observed, and considered a pathogenetic factor of this pitfall.

Introduction

Many risk factors have been considered in order to explain leakage of left colon anastomosis, colo-colic or high colo-rectal : ischemia of the colon segments anastomosed, their inadequate mobilization, or patient’s poor conditions (1-7). On the other hand, the utility of CT in the diagnosis of post-operative peritonitis is well known (8-10). We have considered CT a useful tool also in demonstrating post-surgical conditions, particularly concerning vascular supply of the colon, directly correlated to anastomotic leakage: this has been the aim of the present study.

Methods

We have examined 25 cases of the left colon anastomosis leakage (17 colo-sigmoid and 8 high colo-rectal) observed in the years 2010-2012; 22 of these patients were referred us from other centres. CT was performed in all the patients within the 4th post-operative day, with a multislice technique and intravenous contrast enhancement. The diagnosis of diffuse peritonitis or of localized abscess was possible in all the cases. Vascular lesions, observed in the colonic segments anastomosed, were relevant in 20 cases with the following morpho-radiological signs considered indicative:

1) Arterial hypovascularization, demonstrated by a poor or attenuated arterial network in the colonic mesentery;
2) Poor contrast enhancement of the walls of the colonic anastomosed segments;
3) Their oedema and thickening, with absence of the normal contrast hyper-enhancement of the mucosa (Illustration 1);
4) Dilatation of one or both colon anastomosed segments.

Results

All the above mentioned CT signs have been found associated in the 16 cases of severe diffuse peritonitis, treated promptly by a re-laparotomy. A less evident hypoperfusion, demonstrated only in the afferent loop of the anastomosis, was observed in the other 4 cases of pelvic abscess, treated successfully by a percutaneous drainage.

Discussion

Ischemia of the colon segments is an important pathogenetic factor in anastomotic leakage. It can be CT proved by two fundamental signs:
1) Absence of a clear arterial network of the colon mesentery (Illustration 2,3,4);
2) Contrast hypo-enhancement of the colonic walls, with unclear visualization of the corresponding mucosa.

Oedema of the colon walls can be easily ascribed to an ischemic damage of the micro-circulatory apparatus, while their dilatation can be a consequence of the diffuse peritonitis, with subsequent autonomous nervous system paralysis, resulting in a condition of muscle atony. The same diffuse inflammatory condition can explain the venous congestion and oedema, with lymph nodes enlargement, often observed in the small bowels mesentery.

CT can also demonstrate signs of mesenteric venous thrombosis, complication infrequent today, because of the largely diffused anti-thrombotic prophylaxis.

Conclusion(s)

Surgeons must be interested to know the causes of operative pitfalls, especially if related to anatomo-surgical factors; in case of colon anastomotic dehiscence CT can demonstrate a condition of arterial insufficiency, which must be considered an important pathogenetic factor (11-13).
A demonstrated condition of frank arterial insufficiency often is followed by a diffuse peritonitis, obliging to a prompt re-laparotomy and to a complete take-down of both the colonic segments anastomosed.

An adequate study of the colon vascular anatomy can also be obtained pre-operatively by CT, which permits to detect anatomical variations or pre-existing pathological conditions in the colon vascular supply, and subsequently to choose an adequate operative planning (14,15). An intra-operative recognition of the colonic arterial anatomy must follow, in order to perform a radical lymphadenectomy, and contemporarily assure an adequate vascular supply to the intestinal segments, before their anastomosis.

Reference(s)

14. Manenti A., Marco G., Donatiello S., Vezzelli E. Computed Tomographic interpretation in colonic cancer: let there be more exhaustive. WebmedCentral RADIOLOGY 2012;3(3);WMC 003181.
15. Manenti A. The left hemicolectomy: technical reflections towards standard and enlarged procedures. WebmedCentral SURGICAL TECHNIQUE 2011; 2(10);WMC 002375.
Illustrations

Illustration 1

Post-operative CT: the efferent loop of a failed left-sided colonic anastomosis appears oedematous, thickened, with poor arterial vascular supply and inflammatory strands in the corresponding mesentery.

Illustration 2

Post-operative CT. A) Axial view: leakage of a left-sided colon anastomosis: oedema and thickening of the colonic walls of the afferent loop, with insufficient arterial vascular network, which is better evident in the transverse colon. B) Coronal view: poor vascular supply to the colonic afferent loop of the anastomosis.
Illustration 3

Post-operative CT of a failed left sided colonic anastomosis. A) Axial view: oedema and thickening of the colonic afferent loop, with a fluid collection laterally, and poor vascular network. B) Coronal view: attenuated vascular supply, without evident arterial branches, to the colonic afferent anastomosed segment, markedly dilated.

Illustration 4

Post-operative CT of a failed left sided colo-sigmoid anastomosis. A) Axial view: oedema and dilatation of the afferent loop, with a poor arterial vascular supply. B) Coronal view: evident the insufficient arterial vascular supply of the entire afferent loop.
Reviews

Review 1

Review Title: Dr. Peter J. DiPasco

Posted by Dr. Peter J Dipasco on 11 Jun 2012 11:20:42 PM GMT

What are the main claims of the paper and how important are they?:
That CT imaging can indentify the anatomic reason for failed left colon anastomoses- vascular insufficiency.

Somewhat novel in that I am not aware that anyone has looked for de facto evidence of vascular failure as the cause of a anastomotic dehiscence, but then again this is always one of the indicted culprits.

Yes.

They provide images and explanations of the paucity of vascular supply to the areas of dehisced anastomoses, but I feel with CT imaging there is a large question of the timing of contrast bolusing vis a vis the vasculature outlined.

If a protocol is provided, for example for a randomized controlled trial, are there any important deviations from it? If so, have the authors explained adequately why the deviations occurred?
Not applicable.

Yes. Simple to reproduce.

I do not see an area for improvement with this study, unless proof can be provided that by identifying ros! factors by using this approach offers an improvement in outcomes for the patient such as decreased hospital stay or decreased post-operative abscesses for instance. It is otherwise of little clinical usefulness.

I do not see an area for improvement with this study, unless proof can be provided that by identifying ros! factors by using this approach offers an improvement in outcomes for the patient such as decreased hospital stay or decreased post-operative abscesses for instance. It is otherwise of little clinical usefulness.

Rating: 2

Comment:
Occasional spelling errors. Some lapses in syntax; a english as a primary language editor should be utilitzed prior to submission.

Competing interests: No.

Invited by the author to make a review on this article? : No

Have you previously published on this or a similar topic?: No

References:

Experience and credentials in the specific area of science: I am a General Surgeon and Surgical Oncologist

How to cite: Anonymous.Dr. Peter J. DiPasco[Review of the article 'Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study ' by ],WebmedCentral 1970;3(6):WMCRW001908
Review 2

Review Title: Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study

Posted by Faculty Dr. Mushtaq Chalkoo on 07 Jun 2012 03:29:34 AM GMT

What are the main claims of the paper and how important are they?:
Vascular insufficiency is a known factor for anastomotic leak

Yes
No
No. a randomised controlled study

If a protocol is provided, for example for a randomized controlled trial, are there any important deviations from it? If so, have the authors explained adequately why the deviations occurred?
No

Poor

I think authors need to work more before publishing this paper. In fact you need to have a randomised controlled study before a safe conclusion is drawn that will also avoid the discrepancy in patient factors. Like if the hb level of all patients would be same, conclusion would be more accurate. the manuscript should be precisely written taking care to maintain the idea behind the study and also a special care needs to be taken to maintain the grammar of the essay and avoid technical mistakes. I would recommend authors to have a study of not less than 50 patients before the conclusion is drawn.

thanks

I think authors need to work more before publishing this paper. In fact you need to have a randomised controlled study before a safe conclusion is drawn that will also avoid the discrepancy in patient factors. Like if the hb level of all patients would be same, conclusion would be more accurate. the manuscript should be precisely written taking care to maintain the idea behind the study and also a special care needs to be taken to maintain the grammar of the essay and avoid technical mistakes. I would recommend authors to have a study of not less than 50 patients before the conclusion is drawn.

thanks

Rating: 3

Comment:
Some more work is required

Competing interests: Nil

Invited by the author to make a review on this article?: No

Have you previously published on this or a similar topic?: No

References:
No

Experience and credentials in the specific area of science:
Average

How to cite: Chalkoo M. Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study [Review of the article 'Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed
Tomography Guided Study
Review 3

**Review Title:** Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study

Posted by Dr. Rakesh Thakur on 05 Jun 2012 05:37:01 PM GMT

**What are the main claims of the paper and how important are they?**
Ischemia of the colon segments is an important pathogenetic factor in anastomotic leakage. It can be detected by CT.

Adequate vascularity is most important factor for anastomotic healing. It is more important to diagnose potential ischemia preop or intraop as it helps in planning surgery

No

Adequate vascularity is universal for any healing

Yes

Yes

Intra op findings and histology of colonic end if available would substantiate the claim.

**If a protocol is provided, for example for a randomized controlled trial, are there any important deviations from it? If so, have the authors explained adequately why the deviations occurred?**

NA

YES

Intra op findings like cyanosis, congestion, bleeding edges, doppler

Histology of colonic end

Some of the above will not be available in all cases.

Intra op findings like cyanosis, congestion, bleeding edges, doppler

Histology of colonic end

Some of the above will not be available in all cases.

**Rating:** 6

Comment:
NIL

**Competing interests:** NIL

Invited by the author to make a review on this article? : No

Have you previously published on this or a similar topic?: No

Experience and credentials in the specific area of science:
Frequently encounter anastomotic problem

**How to cite:** Thakur R. Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study [Review of the article 'Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study' by ]. WebmedCentral 1970;3(6):WMCRW001874
Review 4

Review Title: vascular risk factors in left colon anastomosis leakage: a computed tomography guided study

Posted by Faculty Dr. Dnyanesh Belekar on 05 Jun 2012 05:25:16 PM GMT

What are the main claims of the paper and how important are they?:
identification of vascular risk factors in left colon anastomosis leakage & use of CT guided study for this.

yes

not really.

not satisfactorily as the study lacks basic study pattern & methods used.

If a protocol is provided, for example for a randomized controlled trial, are there any important deviations from it? If so, have the authors explained adequately why the deviations occurred?
NA

not very satisfactory.

yes like use of ct angiography & its comparison with vascular doppler study to reveal pattern & level of ischemia.

yes like use of ct angiography & its comparison with vascular doppler study to reveal pattern & level of ischemia.

Rating: 3

Comment:
this paper needs revision & resubmission with use of tables, statistical backup & comparison with other vascular study methodology. it needs basically a clear understanding of the use of this approach everywhere. its not clear what exactly the author wants to send message & its overall usefulness for colonic anastomosis.

Competing interests: 0

Invited by the author to make a review on this article? : No

Have you previously published on this or a similar topic?: No

Experience and credentials in the specific area of science:
being a gastrointestinal & colo-rectal surgeon it is very important to me the assessment of vascularity for any anastomosis specially left colonic one. clinical on table judgement is the best what i feel. CT can be very useful too but it can not tell about pattern of suturing incorporated by a particular surgeon which is very important factor for leak.

Review 5

Review Title: Vascular risk factors in left colon anastomosis

Posted by Prof. Domenico M D'ugo on 05 Jun 2012 01:13:19 PM GMT

What are the main claims of the paper and how important are they?:
It appears rather unclear if the main objective of the study is the attempt of identifying risk factors that are indeed amenable to preventive measures. If not the title of the manuscript should be changed into "CT demonstration of vascular alterations in cases with anastomotic leakage"

The main claim is certainly not novel, even if a CT demonstration of the vascular alterations leading or accompanying an anastomotic leakage or disruption represent a quite recent and somewhat original contribution

Yes they are

What is absolutely needed in order to elevate the level of significance of this study, is examining by CT a series of patients who received the same surgical treatment, comparing the results of the vascular imaging in cases with no complications, cases with delayed bowel movement or painful abdomen and finally in complicated cases with clinical or subclinical evidence of an anastomotic leak. Uni / multi-variate analysis will then demonstrate vascular alterations that are certainly linked with an anastomotic failure.

Moreover a protocol should be provided in order to clearly separate those vascular alteration that are consequent to a localized or diffuse peritonitis, from those which are major determinants of an anastomotic complication.

If a protocol is provided, for example for a randomized controlled trial, are there any important deviations from it? If so, have the authors explained adequately why the deviations occurred?
A protocol should be provided.
Otherwise the paper should change its declared focus, starting from a change of its title.

Yes it is, with some objections that were already made in the previous paragraphs

Yes (see above)
Extra work sounds to be not overwhelming

Yes (see above)
Extra work sounds to be not overwhelming

Rating: 4

Comment:
NA

Competing interests: NA

Invited by the author to make a review on this article? : No

Have you previously published on this or a similar topic?: No

References:

Experience and credentials in the specific area of science: >400 colon resections yearly

Review 6

Review Title: CT evaluation of left colonic anastomosis

Posted by Faculty Mr. Krishna Kumar Govindarajan on 05 Jun 2012 05:54:28 AM GMT

What are the main claims of the paper and how important are they?:
CT evaluation of Vascular supply in the face of leaked colonic anastomosis

In a post operative patient following colonic surgery it is relevant.

No

yes

NA

If a protocol is provided, for example for a randomized controlled trial, are there any important deviations from it? If so, have the authors explained adequately why the deviations occurred?

NA

yes

tabulation of results in a more elaborate manner would help to appreciate the results better

tabulation of results in a more elaborate manner would help to appreciate the results better

Rating: 5

Comment: 

NA

Competing interests: no

Invited by the author to make a review on this article?: No

Have you previously published on this or a similar topic?: No

Experience and credentials in the specific area of science: 

NA

How to cite: Anonymous.CT evaluation of left colonic anastomosis[Review of the article 'Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study ' by ].WebmedCentral 1970;3(6):WMCRW001869
Review 7

Review Title: VAscular risk factors

Posted by Dr. Amit Gupta on 12 May 2012 04:10:38 PM GMT

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<td>1</td>
<td>Is the subject of the article within the scope of the subject category?</td>
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<tr>
<td>2</td>
<td>Are the interpretations / conclusions sound and justified by the data?</td>
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<td>3</td>
<td>Is this a new and original contribution?</td>
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<td>4</td>
<td>Does this paper exemplify an awareness of other research on the topic?</td>
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<td>5</td>
<td>Are structure and length satisfactory?</td>
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<td>6</td>
<td>Can you suggest brief additions or amendments or an introductory statement that will increase the value of this paper for an international audience?</td>
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<td>7</td>
<td>Can you suggest any reductions in the paper, or deletions of parts?</td>
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<td>8</td>
<td>Is the quality of the diction satisfactory?</td>
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<td>9</td>
<td>Are the illustrations and tables necessary and acceptable?</td>
<td>Yes</td>
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<td>10</td>
<td>Are the references adequate and are they all necessary?</td>
<td>Yes</td>
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<td>11</td>
<td>Are the keywords and abstract or summary informative?</td>
<td>Yes</td>
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Rating: 7

Comment:

Overall a very good study but I fail to understand that in place of CECT abdomen why the author had not focussed on CT Angiography of patient if their motive was to prove vascular factor primarily responsible for anastomotic leak in colon. I disagree with author that mesenteric venous thrombosis is on a decline. All the indexed literature suggest that the incidence of mesenteric ischemia is on rise mainly due to increased cardiovascular problems and life style changes. Discussion could have been more elaborate.

Invited by the author to make a review on this article? : No

Have you previously published on this or a similar topic?: Yes

References: Chapter on technique of Anastomosis in the book titled "Basic surgical skills" by JP publications

Experience and credentials in the specific area of science:
We are routinely dealing with colonic surgeries in our hospital

How to cite: Gupta A. VAscular risk factors[Review of the article 'Vascular Risk Factors in Left Colon Anastomosis Leakage: A Computed Tomography Guided Study ' by ].WebmedCentral 1970;3(5):WMCRW001798
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