

fit-Upgrade: A Success Story

Stephan Zangos; Thomas J. Vogl

Institute for Diagnostic and Interventional Radiology, University Hospital Frankfurt, Frankfurt/Main, Germany

We reported on our first experiences with fit-upgrades on the MAGNETOM Avanto^{fit} and MAGNETOM Prisma^{fit} in MAGNETOM Flash [1] a year ago. This article is an update of this experience. fit-upgrades to both MR systems were carried out, problem-free, in only 15 days, without additional rebuilding measures. The magnet remained in the scanner room while all other components were replaced. The fit-upgrades gave us access to the latest MRI technology, including a new gradient system, Tim 4G architecture, and day optimizing throughput (Dot) workflow engines on both systems. Both systems are currently operating without problems and without unscheduled downtime.

These upgrades should help improve workflow and image quality, and ultimately lead to an increase in the number of examinations.

In addition, the new Dot engines provide improved examinations through fast and reproducible imaging. These are now routinely used for all liver, spine, cranial, and heart examinations in our clinic, where examina-

tions can be adapted easily to answer specific questions at decision points.

When financing new devices today, we see a widening gap between the high costs of the system and lower revenue per exam. Today, radiologists aim to develop their own departments, with high quality services at acceptable prices.

Various strategies could be utilized to increase the number of examinations within the same number of working hours. The new systems enable a significant reduction in examination times as a result of better system performance, giving the same image quality. Indeed, the new systems can often provide improved image quality in shorter examination times.

Inexperienced staff can be led through examinations using the guidance features of the new Dot engines, reducing unnecessary or repetitive images. As a result, training time can be significantly reduced and consistent imaging quality achieved. This is an important factor, particularly in teaching hospitals,

where inexperienced staff must often be deployed. The additional use of the Dot engines with their built-in automation assists the technologist during the examinations.

In a retrospective analysis¹ (Table 1), we showed that with the fit-upgrades, exam frequency could be increased in our department by 20.6% to 697 examinations/year using the Avanto^{fit}, and by 13.2% to 469 examinations/year using the Prisma^{fit}. After upgrades, changes in the number of examinations are often multifactorial and cannot be accurately broken down to individual causes. The increased system performance allows us to provide improved image quality to our referring physicians.

After the upgrade we could increase the number of examinations without any conscious change to our examination strategies, or by extending our working hours. In particular, we found that better performance of the new systems and use of the Dot engines were the primary contributors to the increase in number of investigations. Improvement in image quality has also been recognized by our clinical partners, which has led to good acceptance of our MRI examinations in the hospital.

Table 1

	01.01.-31.12.2012	01.01.-31.12.2014
Workdays	252	252
	MAGNETOM Avanto	MAGNETOM Avanto^{fit}
Cases total	3377	4074
Cases/day	13,4	16,2
	MAGNETOM Trio Tim	MAGNETOM Prisma^{fit}
Cases total	3543	4012
Cases/day	14,1	15,9

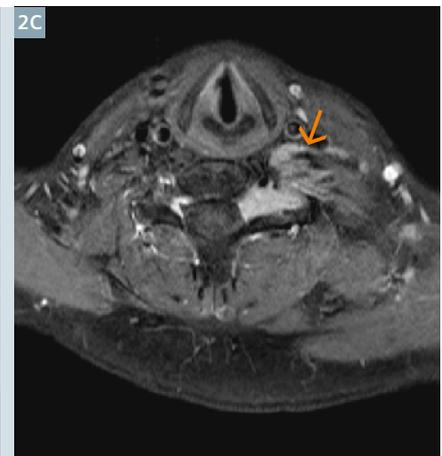
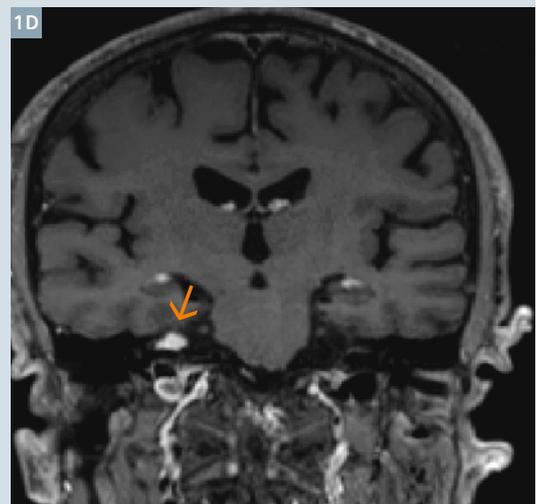
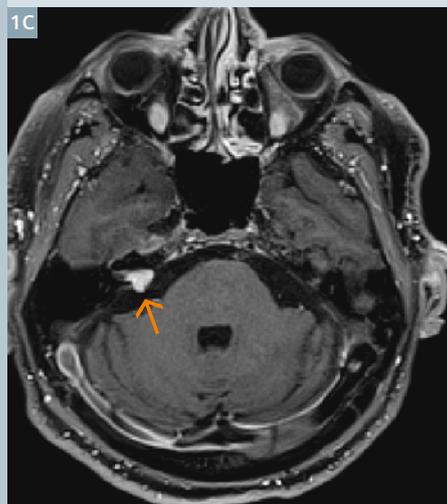
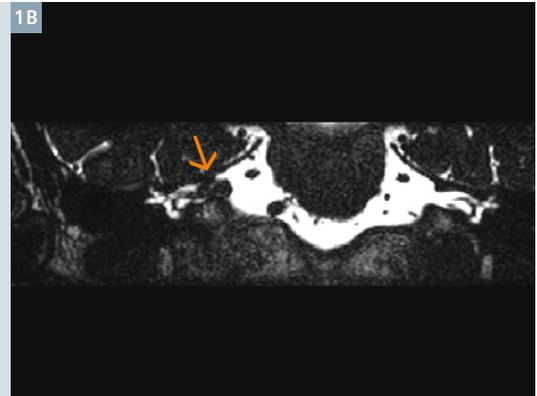
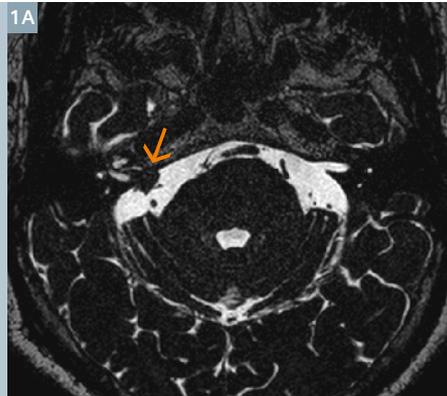
A retrospective analysis¹ shows that the fit-upgrades increased exam frequency in our department. 697 more cases with Avanto^{fit} and 469 more cases with Prisma^{fit}.

Conclusion

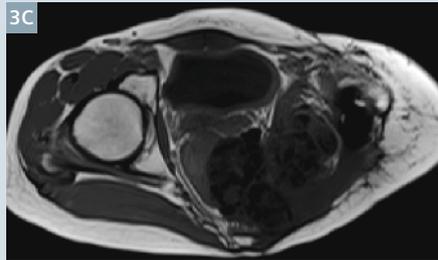
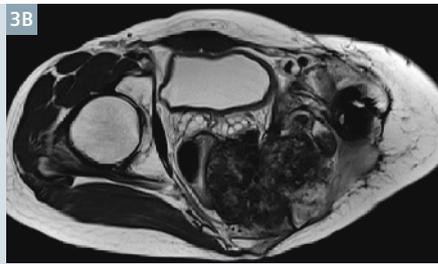
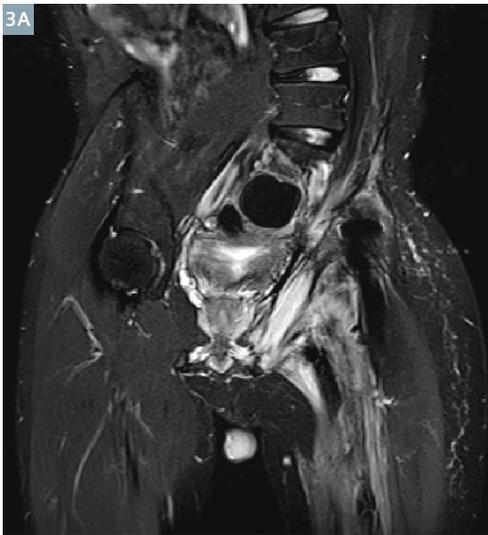
The fit-upgrade remains an economically attractive approach for an aged MR system. By improving system performance and workflow using the system software, the number of examinations can be increased, together with improved image quality, with little effort.

¹ The statements by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no 'typical' setting and many variables exist there can be no guarantee that other customers will achieve the same results.

- 1** (1A, B) Representation of an acoustic neurinoma (arrow) on the MAGNETOM Avanto^{fit}. T2-weighted SPACE transversal (TR 1200 ms, TE 264 ms, slice thickness 0.6 mm) and reconstructed coronal slice orientations. (1C, D) Contrast-enhanced T1-weighted MPRAGE (TR 1800 ms, TE 2.6 ms, slice thickness 1 mm) with automatically calculated coronal MPR.



- 2** Relapse of B-NHL (arrow) on the Avanto^{fit}. Comparison of the T2w TSE (TR 4000 ms, TE 79 ms; slice thickness 5 mm), T2w TIRM (TR 4140 ms, TE 32 ms; slice thickness 6 mm) and contrast-enhanced T1w TSE FS-Dixon sequences (TR 520 ms, TE 14 ms; slice thickness 5 mm). The images show homogeneous fat saturation in this problem area, facilitating diagnosis.



3 Recurrence after resection of osteosarcoma of the ilium on the MAGNETOM Avanto^{fit}. T2w TIRM WARP (TR 4670 ms, TE 39 ms; slice thickness 5 mm), T2w TSE WARP (TR 5530 ms, TE 77 ms; slice thickness 6 mm), T1w TSE WARP (TR 500 ms, TE 7 ms; slice thickness, 6 mm), and T1w TSE WARP sequences show the reduction of metal artifacts of tumor prosthesis.



4 MIP (maximum intensity projection) of a TWIST angiography in neutral and provocation positions on the MAGNETOM Avanto^{fit}. The images show an entrapment on the left side.

References

- 1 Zangos S, Vogl TJ. MAGNETOM Trio upgrade to Prisma^{fit} better imaging technique combined with higher throughput in clinical practice. MAGNETOM Flash no. 58, 3(2014): 32-38.



Thomas J. Vogl



Stephan Zangos

Contact

Prof. Dr. med. Stephan Zangos
 Institute for Diagnostic and Interventional Radiology
 University Hospital Frankfurt
 Theodor-Stern-Kai 7
 Haus 23c
 60590 Frankfurt am Main
 Germany
 Phone: + 49 (0)69 6301-87287
 Fax: +49 (0)69 6301-7288
 zangos@em.uni-frankfurt.de