Case Report

Iron Deficiency Anemia Improved by Dental Implantation: A Case Report

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Abstract

Treatments for improving iron deficiency anemia are generally aimed at increasing oral iron intake and/or administration. Such treatments, however, have been unsuccessful in managing nutritional disorders, including anemia, in patients with masticatory dysfunction caused by impaired occlusion. Nevertheless, few studies have assessed the potential benefits of providing optimal occlusion in such cases. Here, we report a case involving a 53-year-old woman with iron deficiency anemia, wherein we attempted to facilitate efficient mastication by establishing functional occlusion with dental implant placement. The patient was diagnosed with iron deficiency anemia and hospitalized for blood transfusion 2 years before she visited our dental clinic. At the first visit, her hemoglobin (Hb) and mean corpuscular volume values were low; sodium ferrous citrate administration and dietary guidance led to slight improvement. However, blood transfusions and iron supplementation had been ineffective over longer duration. After dental implant placement, her Hb and mean corpuscular volume values were restored and maintained for >4 years without medication. Through this report, we highlight an alternative, non-pharmacological treatment strategy for iron deficiency anemia.

Keywords: Dental implants, ferritins, hemoglobin, iron-deficiency anemia

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INTRODUCTION

Iron deficiency anemia is relatively prevalent in Japan.[1] The daily iron intake of the average Japanese individual has remarkably decreased over the past five decades,[2] partly because of dietary changes.[3] Iron deficiency is particularly prevalent in Japanese women aged 40–49 years, who are diagnosed with anemia if hemoglobin (Hb) levels are <11.2 g/dL, often requiring iron supplementation.[4]

Red meat has a high iron content and absorption rate; however, only 30% maximal absorption has been reported.[5,6] Good oral function with efficient mastication optimizes iron absorption. Indeed, many patients with iron deficiency anemia also have diminished oral function, which requires fixed denture treatment.[7]

While dental implants improve oral function, their impact on anemia is unknown.[8] Here, we report a case involving a middle-aged woman with persistent iron deficiency anemia despite medications and blood transfusions, who showed considerable improvement after receiving an implant-supported fixed denture.

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CASE REPORT

A 53-year-old Japanese woman presented with impaired mastication associated with a loose maxillary bridge. Two years and 4 months prior to the initial visit, she was examined at the Department of Internal Medicine in a general hospital because she complained of lightheadedness when standing up and pharyngeal discomfort.

She was diagnosed with iron deficiency anemia. She had irregular menstruation at the age of 43 years and completed menopause at the age of 44 years. She had no history of uterine fibroids. Gastrointestinal tract malignancy was suspected; however, tests for carcinoembryonic antigen and carbohydrate antigen 19-9 as well as upper and lower gastrointestinal endoscopy revealed no malignancies.

She received two red blood cell transfusions (280 mL). On the day following the second blood transfusion, she was prescribed sodium ferrous citrate 100 mg/day for 60 days. On completion of that regimen, her Hb, mean corpuscular volume (MCV) and iron values were restored to 11.7 g/dL, 78.5 fL and 323 μg/dL, respectively. Medication and dietary guidance were discontinued and severe fatigue was remarkably alleviated.

After 2 years and 2 months, the patient presented at the outpatient department of another hospital, and her Hb, MCV, and iron values were 10.4 g/dL, 71 fL, and 21 μg/dL, respectively. Two months later, she presented to our clinic with luxation of several teeth under the maxillary dental bridge. Her missing teeth were #17, 16, 11, 12, 24, 25, 26, 36, 46 and 47 [Figure 1]. She was diagnosed as aggressive periodontitis involving #14, 13, 12, 22, 23, 25, and 36 [Figure 2]. She requested implant-supported prostheses, so we performed a blood test, extracted the teeth having poor prognoses and started treatment for periodontitis. No oral findings peculiar to iron deficiency anemia, such as pallor, atrophic glossitis and fissured tongue, were observed [Figure 3]. We examined the local condition by the dental cone-beam CT (CBCT) [Figure 4] to determine if implant-supported fixed prostheses or overdenture in the maxilla is more suitable.

Figure 1: Oral condition at the initial visit. Teeth #14, 13, 12, 22, 23, and 25 were grade 3 mobile, and the #35-#37 bridge was grade 2 mobile. Occlusal pain was present in the right upper molar area

For the mandible, we planned fixed prostheses over single-tooth implants in the 36 and 46 regions. At her initial visit in January 2013, the patient's Hb level and MCV were 9.9 g/dL and 68 fL, respectively, leading to a suspicion of iron deficiency anemia. We advised the patient to visit an internal medicine clinic, where sodium ferrous citrate administration (200 mg/day) and dietary guidance were initiated and continued for 2 months. Subsequently, her Hb level and MCV increased to 10.4 g/dL and 71.0 fL, respectively. The iron supplementation was discontinued thereafter.

In February 2013, we extracted the teeth with poor prognoses. In May 2013, C-type Mytis Arrow Implants (Brain Base Corporation, Tokyo, Japan) were inserted by simulating with the CBCT [Figures 3-5]. Upon the patient's approval of the functionality and esthetics of the implants, the final prosthesis was fitted in January 2014 [Figure 6]. Subsequently, oral maintenance therapy and peripheral blood tests were performed every 3 and 4 months, respectively. Each blood sampling was performed under fasting conditions at around 9:00 am at our clinic.

Five years after the treatment, there was no abnormal bone resorption surrounding the implants or remaining teeth and no surrounding gingival inflammation [Figure 2]. The patient was satisfied and her oral hygiene status was favorable.

The patient maintained her bloot test baseline values at all follow-up visits and her iron levels did not deteriorate at any point [Figure 7 and Table 1]. Similarly, her weight did not change significantly (54.4 kg at first visit; 56.2 kg after 5 years).

DISCUSSION

While the primary purpose of implant treatment is the improvement and maintenance of masticatory efficiency, our case report indicates that such treatment can also improve the nutritional status and resolve iron deficiency

Table 1: Hematology results at the initial visit and after placement of implant superstructures at our clinic

Variables	First visit	Follow-up after	Follow-up after	Follow-up after	Follow-up after	Follow-up after	Follow-up after	Follow-up after	Reference values
	0	2 years 1 month	3 years 6 months	3 years 10 months	4 years 2 months	4 years 3 months	4 years 10 months	5 years 2 months	
RBC	506	448	456	471	463	464	462	453	376-516 10,000/μL**
HB	9.9	13.2	13.3	14.2	13.8	13.7	14.2	13.8	11.2-15.2 g/dL*
Hematocrit	34.2	39.7	41.3	43.3	43.2	42.8	43.4	41.9	34.3-45.2%*
MCV	68.0	89.0	91.0	92.0	93.0	92.0	94.0	92.0	80-101 fL*
MCH	19.6	29.5	29.2	30.1	29.8	29.5	30.7	30.5	26.4-34.3 pg*
MCHC	28.9	33.2	32.2	32.8	31.9	32.0	32.7	32.9	31.3-36.1%*
TP	7.3	7.0	6.5	7.5	6.8	7.0	7.2	7.0	6.5-8.2 g/dL
ALB	3.9	3.7	3.6	4.0	3.9	3.9	4.1	4.0	3.7-5.5 g/dL
Ferritin					25.0	31.5	31.8	30.8	5-157 ng/mL*
A1C/NGSP	5.9	5.2	5.3	5.2	5.3	5.3	5.3	5.3	4.6-6.2%
Serum iron					81.0		123.0		50-170 μg/dL*
TIBC					323.0	328.0	383.0		250-460 μg/dL

*Day 0 is defined as the first visit day; **Reference range for women. RBC – Red blood cell; HB – Hemoglobin; MCV – Mean corpuscular volume; MCH – Mean corpuscular hemoglobin; MCHC – MCH concentration; TP – Total protein; ALB – Albumin; A1C/NGSP – Hemoglobin A1c; TIBC – Total iron binding capacity

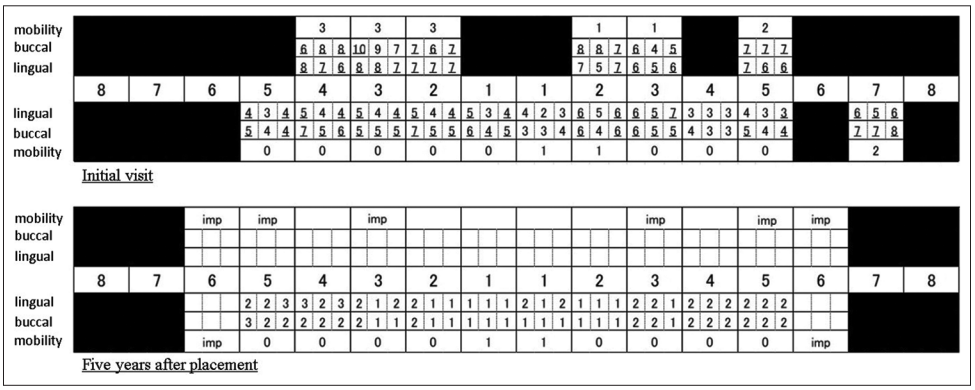

Figure 2: Periodontal examination at the initial visit (above) and 5 years after placement of the superstructures

Figure 3: Oral condition immediately before implant placement, 5 months after the initial visit

anemia. Despite discontinuing iron supplements, the patient exhibited an increase in Hb, MCV and ferritin levels after maxillary prosthesis insertion. These values improved further during the maintenance period.

Iron deficiency anemia accounts for the majority of anemia cases[9] and may require hospitalization if severe, as observed in the present case. Despite receiving dietary guidance and actively consuming iron-rich foods, our patient did not exhibit a marked improvement. At her first visit to our clinic, her Hb level decreased from 11.7 g/dL to 9.9 g/dL. In addition, her maxillary bridge was found to be unstable, and her masticatory ability and food intake were decreased. An increased dose of sodium ferrous citrate (200 mg/day) was administered for 2 months, but her Hb level increased by only 0.5 g/dL (from 9.9 g/dL to 10.4 g/dL).

Tooth extraction was essential to prevent infection; thus, we extracted the teeth and carefully followed the healing process. There were no extraction-related complications, so we suggested that tooth extraction would not affect the implant treatment.

Iron deficiency anemia may affect bone healing,[10] which is important for implant treatment. In addition, after the

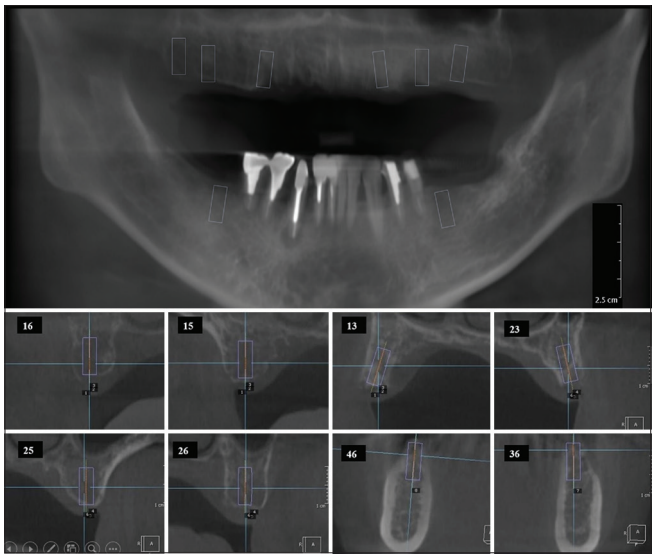

Figure 4: Cone beam computed tomography simulation before implant placement: Rectangular mark is 4.0 mm × 10.0 mm. Sufficient bone volume both in length and in width was found for implant placement

Figure 6: Oral condition 1 year after the initial visit. Masticatory ability equivalent to that of the natural dentition was obtained with a total jaw implant prosthesis

implant surgery, anemia may worsen at a certain period, because iron intake will be reduced due to the pain, swelling and discomfort. Therefore, although the implant treatment was successful and the prognosis was good, we did not expect iron deficiency to improve after the implant superstructure was in place.

The first-line treatment for iron deficiency anemia is diet therapy. Consuming a nutritionally adjusted diet and wearing the improved removable dentures increased Hb levels in our patient, but the increase was small.[11] Fixed implant superstructure improves oral function and is considered to induce masticatory ability similar to that of healthy natural dentition.[12] This, in turn, greatly promotes a balanced and

Figure 5: Orthopantograph after implant placement. Mytis Arrow Implant C type were placed in the order of #16, 15, 13, 23, 25, 26, 36, 46. The width and length are as follows: ϕ4.6 mm 12 mm, ϕ4.0 mm 12 mm, ϕ3.7 mm 12 mm, ϕ4.0 mm 12 mm, ϕ4.0 mm 10 mm, ϕ4.6 mm 10 mm, ϕ4.6 mm 12 mm, ϕ4.0 mm 12 mm

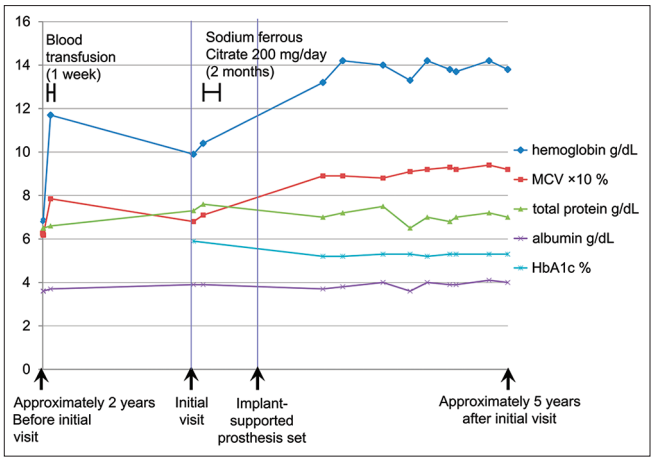

Figure 7: Changes in hemoglobin, mean corpuscular volume, total protein, albumin and glycated hemoglobin values over 7 years and 6 months

healthy diet, resulting in increased levels of Hb and ferritin. The implant therapy enabled the patient to consume a diverse diet that included hard foods, thereby leading to amelioration of the iron deficiency anemia. This also resulted in marginal increase in her weight post-completion of the treatment. Simultaneously, her soft carbohydrate intake also reduced. Furthermore, the glycated Hb level of 5.9% observed during the first visit decreased to 5.3% throughout the maintenance period [Figure 7].

CONCLUSION

Restoration of adequate occlusion and improvement of masticatory function following implant therapy may be an alternative to pharmacological treatment for managing iron deficiency anemia.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information

to be reported in the Journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Peer review

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Conflicts of interest

There are no conflicts of interest.

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